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MAGNETIC TAPE COPIES OF MIT GEOPHYSICS PROGRAM SET II

(TIME SERIES PROGRAMS FOR THE IBM 709, 7090, 7094)

S. M. Simpson, Jr.

Massachusetts Institute of Technology  
Cambridge 39, Massachusetts

Contract No. AF19(604)-7378

Project No. 86-2

Task No. 865203

Scientific Report No. 10

March 31, 1965

Work Sponsored by Advanced Research Projects Agency

Project Vela-Uniform

ARPA Order No. 180-61, Amendment 2

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ARPA  
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1965

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## ABSTRACT

The set of programs known as "MIT Geophysics Program Set I" has been expanded, edited, and upgraded to form Set II. This new set consists of 267 programs for the IBM 709, 7090, 7094 and is available to qualified applicants, via magnetic tape copies of the symbolic decks, from the Seismic Data Laboratory of United Electrodynamics. A complete copy requires two 2400 foot high density (900 BPI) tapes.

The symbolic decks of Set II form an interlocking system of self-documenting (including examples) subroutines written in FORTRAN and FAP (compatible with FORTRAN-II) concerned primarily with single and multiple time series analysis. Because of the subroutine nature of its construction, however, much of the system is readily accessible for use in other computational areas.

The new programs in Set II concentrate largely on utility functions (graphical and other input-output, miscellaneous numerical operators) and on time series operators for multidimensional and multi-input processes (including in particular high speed recursion techniques for solving least squares simultaneous equations). A handful of specialized or outmoded programs from Set I has been suppressed; most of the others have been upgraded with respect to documentation; and some have been modified with respect to coding.

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## 1. Introduction

MIT Geophysics Program Set II is an expanded, modified version of Program Set I which was introduced (Simpson, 1962) as follows.

"The MIT Department of Geology and Geophysics has a history in time series computations by high speed computers which extends back to 1952 when it began using Whirlwind I to instrument Wiener's optimum filter concepts in the signal-noise problems of reflection seismology. Since then it has steadily developed and expanded the computer technology of time series analysis, adapting computational concepts to the shifting ground of new machine languages.

"The programs developed in this process have been made available on an individual basis in the past but, particularly with impetus from VELA UNIFORM research, the increased volume of requests have necessitated a more concentrated effort to systematize this distribution. Moreover, the widespread adoption of FORTRAN and IBM 700 series machines justifies for us the considerable effort we have taken to carefully document and assemble the large number of our most useful programs which we are now making available as "MIT Geophysics Program Set I.

"Symbolic programs are the best for general distribution and because of the number of cards involved (over 23,000) we have chosen to transmit them by magnetic tape. The symbolic programs on the tape copies are completely self-explanatory. The present report is concerned with supplementary information such as complete tables of contents, conventions used in program design and description, details on the production and testing of the master tape, and a KWIC-type index to the programs.

"The bulk of the programs included are the work of Stephen M. Simpson, Jr., Jon F. Claerbout, James N. Galbraith, and Ralph A. Wiggins, but they include contributions from Jacqueline Clark, Enders A. Robinson, Roy J. Greenfield, and there are a few programs originating in the MIT Computation Center as well as one or two modifications

of FORTRAN system routines. Authorship is given individually in the comment cards of each program.

"The production and testing of the master tape involved not only the work of the authors but also extensive test program writing by Joseph Procito and seemingly endless card preparation, handling and editing by Elizabeth Studer, Dauna Trop, and Karl Gentili to whom the authors are most grateful.

"Test computations were performed both on the IBM 7090 at the MIT Computation Center and on the IBM 709 of the Cooperative Computing Laboratory of MIT, with the valuable assistance of Michael Saxton and Anthony Sacco, respectively."

The above serves to introduce Program Set II with the following additional comments

1. The symbolic card count now exceeds 50,000.
2. The names of Mrs. Myrna Kasser, Regina Lahteine, and Mrs. Barbara Cullum should be added to the list of those assisting in punched card work and the names of John Harmon, Thomas Burhoe, Mason Fleming and William Jarvis to the list of computer operators.
3. The IBM 7094 of the MIT Computation Center was the principal computing instrument used during the period since Program Set I.

#### REFERENCE

Simpson, Jr., S. M., 1962, Magnetic tape copies of MIT Geophysics Program Set I (Time series programs for the IBM 709, 7090): Sci. Rept. 4 of Contract AF 19(604)7378, AFCRL-65-207, ARPA Project VELA UNIFORM.

## 2. Tables of Contents of the Symbolic Tapes

The symbolic versions of the 267 programs of Set II appear on two BCD tapes, 116 on the first tape and 151 on the second. The first file of each tape gives a table of contents for that tape, and the remaining files are the successive programs, ordered alphabetically by program name, terminated by an "END TAPE" file. Consequently the first tape contains 118 files and the second one 153 files. The following 11 pages show listings of the first files of the two tapes.

Listing of first file of Tape 1 of  
Program Set II (Page 1 of 5)

• TABLE OF CONTENTS  
• FILE NO. 1 ON THIS TAPE IS  
• TABLE OF CONTENTS  
• FILE NO. 2 ON THIS TAPE IS  
• • A'SVAL FAST ABSOLUTE VALUE OF A VECTOR  
• FILE NO. 3 ON THIS TAPE IS  
• • ADANL MODIFY AUTO- OR CROSS-CORRELATIONS FOR DANIELL SPECTRA  
• FILE NO. 4 ON THIS TAPE IS  
• • ADDK MODIFY A SET OF VARIABLES BY A CONSTANT OR BY CONSTANTS  
• FILE NO. 5 ON THIS TAPE IS  
• • AMPHZ AMPLITUDE AND PHASE FROM REAL AND IMAGINARY, OR REVERSE  
• FILE NO. 6 ON THIS TAPE IS  
• • ARBCLL FIND A MATRIX COLUMN WITH ARBITRARY INDEX BY INTERPOLATION  
• FILE NO. 7 ON THIS TAPE IS  
• • ARCTAN ARCTANGENT FUNCTION  
• FILE NO. 8 ON THIS TAPE IS  
• • ASPECT FAST COSINE TRANSFORMS OF ONE-SIDED AUTOCORRELATIONS  
• FILE NO. 9 ON THIS TAPE IS  
• • ASPEC? AUTOSPECTRUM BY COSINE TRANSFORM OF AUTOCORRELATION  
• FILE NO. 10 ON THIS TAPE IS  
• • AVERAGE FIND AVERAGE OF FLOATING VECTOR  
• FILE NO. 11 ON THIS TAPE IS  
• • BLKSLM SUMMATION OF VECTOR OVER ABUTTING BLOCKS OF CONSTANT LENGTH  
• FILE NO. 12 ON THIS TAPE IS  
• • BOOST ADD A CONSTANT TO ELEMENTS OF A FXD OR FLTG VECTOR  
• FILE NO. 13 ON THIS TAPE IS  
• • CARIGE SPACE CARRIAGE N LINES OR RESTORE PAGE  
• FILE NO. 14 ON THIS TAPE IS  
• • CHISQR COMPUTE CHI-SQUARE FOR CONSTANT PROBABILITY CASE  
• FILE NO. 15 ON THIS TAPE IS  
• • CHOOSE SET A LIST OF VARIABLES TO ONE OF TWO SETS OF VALUES  
• FILE NO. 16 ON THIS TAPE IS  
• • CHPRTS FAST REVERSAL OF SPECIAL VECTORS (AS PRODUCED BY SPLIT)  
• FILE NO. 17 ON THIS TAPE IS  
• • CHSIGN CHANGE ALL SIGN BITS OF A VECTOR  
• FILE NO. 18 ON THIS TAPE IS  
• • CLKON CHECK IF INTERVAL TIMER IS ON MAKING ON-LINE REQUEST IF NOT  
• FILE NO. 19 ON THIS TAPE IS  
• • CLOCK1 (7090) FOR REAL TIME TIMING IN SECONDS USING 7090 INTERVAL CLOCK  
• FILE NO. 20 ON THIS TAPE IS  
• • CMPARP COMPARE PAIRS OF VARIABLES OR A SET OF VARIABLES FOR EQUALITY  
• FILE NO. 21 ON THIS TAPE IS  
• • CMPARV FAST COMPARE TWO ARBITRARY MODE VECTORS FOR IDENTITY  
• FILE NO. 22 ON THIS TAPE IS  
• • CMPRA COMPARE ARITHMETICALLY TWO WORDS WHERE -0 IS LESS THAN +0  
• FILE NO. 23 ON THIS TAPE IS  
• • CNTRCB CONTOUR A MATRIX ON THE PRINTER IN DECIBELS  
• FILE NO. 24 ON THIS TAPE IS  
• • CNTRCW FIND CONTOUR LEVELS FOR PLOTTING A ROW OF DATA  
• FILE NO. 25 ON THIS TAPE IS  
• • COLABL LABEL PRINTER COLUMNS WITH INCREASING 3-DIGIT INTEGERS  
• FILE NO. 26 ON THIS TAPE IS  
• • COLAPS COLLAPSE ONE-SIDED VECTOR INTO SMALLER RANGE  
• FILE NO. 27 ON THIS TAPE IS  
• • CONTRC CONTOUR OF MATRIX SUBSET ON OFF-LINE PRINTER

Listing of first file of Tape 1 of  
Program Set II (Page 2 of 5)

- \* FILE NO. 28 ON THIS TAPE IS COMPLETE CONVOLUTION OF TWO TRANSIENTS
- \* FILE NO. 29 ON THIS TAPE IS COMPLETE CONVOLUTION OF TWO TRANSIENTS
- \* FILE NO. 30 ON THIS TAPE IS FAST COSINE AND/OR SINE TRANSFORMS OF ODD-LENGTH SERIES
- \* FILE NO. 31 ON THIS TAPE IS FAST COSINE AND/OR SINE TRANSFORMS FROM 2 OR 4 EVEN-ODD PARTS
- \* FILE NO. 32 ON THIS TAPE IS GENERATE COSINE OR SINE HALF-WAVE TABLES, FIXED OR FLOATING
- \* FILE NO. 33 ON THIS TAPE IS FAST COPY FILE FROM ONE TAPE TO ANOTHER - VERSION 2
- \* FILE NO. 34 ON THIS TAPE IS CROSSCORRELATION OF TRANSIENTS BEGINNING WITH ZERO LAG
- \* FILE NO. 35 ON THIS TAPE IS CROSSCORRELATION OF TRANSIENTS BEGINNING WITH ANY LAG
- \* FILE NO. 36 ON THIS TAPE IS CROSSCORRELATION OF TRANSIENT VECTORS OF MATRICES
- \* FILE NO. 37 ON THIS TAPE IS OUTPUT VARIABLES FIVE PER LINE IN G FORMAT
- \* FILE NO. 38 ON THIS TAPE IS FIND CUBIC WHICH EXACTLY FITS 4 EQUALLY ED POINTS
- \* FILE NO. 39 ON THIS TAPE IS OUTPUT COLUMN VECTORS BY NORMAL OR LITERAL FORMATS
- \* FILE NO. 40 ON THIS TAPE IS LIST DATA DECK AND REPOSITION TAPE TO FRONT OF DECK
- \* FILE NO. 41 ON THIS TAPE IS DELTA FUNCTION AND STEP FUNCTIONS, FLOATING AND FIXED POINT
- \* FILE NO. 42 ON THIS TAPE IS DERIVATIVE OF A VECTOR BY DIFFERENCING
- \* FILE NO. 43 ON THIS TAPE IS DIFFERENCE FIXED OR FLOATING VECTOR ELEMENTS IN PAIRS
- \* FILE NO. 44 ON THIS TAPE IS DISPLA (709) WRITE HOLLERITH TEXT ON SCOPE
- \* FILE NO. 45 ON THIS TAPE IS DISPLA(7090) WRITE HOLLERITH TEXT ON SCOPE
- \* FILE NO. 46 ON THIS TAPE IS DIVIDE A FLOATING VECTOR BY A CONSTANT
- \* FILE NO. 47 ON THIS TAPE IS VECTOR DOT PRODUCT WITH ARBITRARY INCREMENTS
- \* FILE NO. 48 ON THIS TAPE IS DOTP DISPLACED DOT PRODUCT OF 2-DIMENSIONAL ARRAYS
- \* FILE NO. 49 ON THIS TAPE IS DSPFFT VARIABLE ORIGIN FORMAT GENERATOR FOR SCOPE SUBROUTINE DISPLA
- \* FILE NO. 50 ON THIS TAPE IS DUBLX FAST DOUBLING OR HALVING OF A VECTOR (FIXED OR FLOATING)
- \* FILE NO. 51 ON THIS TAPE IS EXCHVS EXCHANGE ANY TWO VECTORS
- \* FILE NO. 52 ON THIS TAPE IS EXPAND HI-SPEED EXPANSION OF A VECTOR UNDER CUBIC INTERPOLATION
- \* FILE NO. 53 ON THIS TAPE IS FACTCR FACTOR POWER SPECTRUM TO FIND MINIMUM PHASE WAVELET
- \* FILE NO. 54 ON THIS TAPE IS FAPSLM COMPUTE A LOGICAL SUMCHECK

Listing of first file of Tape 1 of  
Program Set II (Page 3 of 5)

- \* FILE NO. 55 ON THIS TAPE IS  
\* FASCN1 FAST SCAN VECTOR FOR ELEMENT EQUAL OR GREATER THAN GIVEN VALUE
- \* FILE NO. 56 ON THIS TAPE IS  
\* FASCLB FAST EVALUATE CUBIC FOR EVENLY SPACED ARGUMENTS
- \* FILE NO. 57 ON THIS TAPE IS  
\* FASTRK FAST TRACK THROUGH A VECTOR OF INDICES
- \* FILE NO. 58 ON THIS TAPE IS  
\* FOOT FAST DOT PRODUCT OF TWO VECTORS
- \* FILE NO. 59 ON THIS TAPE IS  
\* FIRE2 TWO-DIMENSIONAL FILTER BY RECURSION
- \* FILE NO. 60 ON THIS TAPE IS  
\* FIXV FIX A FLOATING VECTOR WITH OR WITHOUT ROUNDING
- \* FILE NO. 61 ON THIS TAPE IS  
\* FLOATM FLOAT ANY MACHINE LANGUAGE INTEGER
- \* FILE NO. 62 ON THIS TAPE IS  
\* FLOATV FLOAT A VECTOR
- \* FILE NO. 63 ON THIS TAPE IS  
\* FMTOUT WRITE OUTPUT TAPE WITH NORMAL OR LITERAL FORMAT VECTOR
- \* FILE NO. 64 ON THIS TAPE IS  
\* FNDFMT ACCESS TO LITERAL OR ORDINARY FORMAT
- \* FILE NO. 65 ON THIS TAPE IS  
\* FRAME (709) ADVANCE FILM FRAME ON SCOPE
- \* FILE NO. 66 ON THIS TAPE IS  
\* FRAME(7090) ADVANCE FILM FRAME ON SCOPE
- \* FILE NO. 67 ON THIS TAPE IS  
\* FRQCT1 FREQUENCY DISTRIBUTION OF A FIXED POINT VECTOR
- \* FILE NO. 68 ON THIS TAPE IS  
\* FRQCT2 FREQUENCY COUNT OF NUMBER OF VALUES OF A SERIES IN GIVEN RANGES
- \* FILE NO. 69 ON THIS TAPE IS  
\* FSKIP SKIP FORWARD OR BACKWARD OVER FILES ON TAPE
- \* FILE NO. 70 ON THIS TAPE IS  
\* FT24 HIGH SPEED 24 POINT SPECTRUM
- \* FILE NO. 71 ON THIS TAPE IS  
\* FT24 -II HIGH SPEED 24 POINT SPECTRUM
- \* FILE NO. 72 ON THIS TAPE IS  
\* FXCATA SCALE, CONVERT FLTG. VECTOR TO MACHINE INTEGERS OR CONVERSELY
- \* FILE NO. 73 ON THIS TAPE IS  
\* GENHCL GENERATE HOLLERITH FIELD
- \* FILE NO. 74 ON THIS TAPE IS  
\* GETHCL GET HOLLERITH DATA FROM CALLING SEQUENCE
- \* FILE NO. 75 ON THIS TAPE IS  
\* GETRC1 ACCESS ROUTINE FOR RAND CORP. MILLION RANDOM DIGITS FROM TAPE
- \* FILE NO. 76 ON THIS TAPE IS  
\* GETX ALLOWS VARIABLE DEPTH INDEXING OF VECTORS
- \* FILE NO. 77 ON THIS TAPE IS  
\* GNFLTI GENERATE SYMMETRICAL FILTER WITH GIVEN AMPLITUDE RESPONSE
- \* FILE NO. 78 ON THIS TAPE IS  
\* GNHOL2 GENERATE HOLLERITH CHARACTERS
- \* FILE NO. 79 ON THIS TAPE IS  
\* GRAPF MULTIPLE FRAME SCOPE PLOTS OF VECTOR SETS
- \* FILE NO. 80 ON THIS TAPE IS  
\* GRAPHX SUBROUTINE GRAPH EXPANDED OVER VERTICAL FRAMES
- \* FILE NO. 81 ON THIS TAPE IS  
\* GRUP2 DIVIDE THE X AXIS INTO EQUALLY PROBABLE RANGES

Listing of first file of Tape 1 of  
Program Set II (Page 4 of 5)

- \* FILE NO. 82 ON THIS TAPE IS  
• HLAQJ HOLLERITH LEFT ADJUST OR RIGHT ADJUST FUNCTION
- \* FILE NO. 83 ON THIS TAPE IS  
• HSTPLT HISTOGRAM PLOTTING FOR SUBROUTINE GRAPH
- \* FILE NO. 84 ON THIS TAPE IS  
• HSTPLT-II BAR GRAPH PLOTTING FOR SUBROUTINE GRAPH
- \* FILE NO. 85 ON THIS TAPE IS  
• HSTPLT-III(709) CUBIC CURVE SCOPE PLOTTING FOR SUBROUTINE GRAPH
- \* FILE NO. 86 ON THIS TAPE IS  
• HSTPLT-III(7090) CUBIC CURVE SCOPE PLOTTING FOR SUBROUTINE GRAPH
- \* FILE NO. 87 ON THIS TAPE IS  
• HVTOIV SPREAD OUT HOLLERITH VECTOR AS FORTRAN INTEGERS
- \* FILE NO. 88 ON THIS TAPE IS  
• IDERIV INVERSION OF DIFFERENTIATION BY DIFFERENCING
- \* FILE NO. 89 ON THIS TAPE IS  
• IFNCTN INVERSION OF A MONOTONE FUNCTION BY LINEAR INTERPOLATION
- \* FILE NO. 90 ON THIS TAPE IS  
• IINTGR INVERSION OF TRAPEZOIDAL INTEGRAL
- \* FILE NO. 91 ON THIS TAPE IS  
• INDATA FAST AND CONVENIENT RETRIEVAL OF DATA FROM A SPECIAL TAPE
- \* FILE NO. 92 ON THIS TAPE IS  
• INDEX HYBRID SUBPROGRAMS FOR INCREMENTING, TESTING, AND SETTING
- \* FILE NO. 93 ON THIS TAPE IS  
• INTGRA INDEFINITE INTEGRAL BY TRAPEZOIDAL RULE
- \* FILE NO. 94 ON THIS TAPE IS  
• INTHCL INTERPRET HOLLERITH
- \* FILE NO. 95 ON THIS TAPE IS  
• INTOPR INTERPOLATION OPERATOR FOR 1 TO 4 EVENLY SPACED DATA VALUES
- \* FILE NO. 96 ON THIS TAPE IS  
• INTSLM INTEGRATED SUMMATION OF A FLOATING OF FIXED VECTOR
- \* FILE NO. 97 ON THIS TAPE IS  
• IPLYEV COMPLEX POLYNOMIAL EVALUATION
- \* FILE NO. 98 ON THIS TAPE IS  
• ITOMLI FAST CONVERT FORTRAN INTEGER VECTOR TO MLI VECTOR
- \* FILE NO. 99 ON THIS TAPE IS  
• IVTOIV PACK UP FORTRAN INTEGER VECTOR AS HOLLERITH VECTOR
- \* FILE NO. 100 ON THIS TAPE IS  
• IXCARG LOCATE ARGUMENT WITH RESPECT TO COMMON
- \* FILE NO. 101 ON THIS TAPE IS  
• KIINTI PROBABILITY THAT A CHI-SQUARED VARIATE EXCEEDS A VALUE
- \* FILE NO. 102 ON THIS TAPE IS  
• KOLAPS COLLAPSE ODD-LENGTHED VECTOR ABOUT ITS MIDPOINT
- \* FILE NO. 103 ON THIS TAPE IS  
• LIMITS CHECK THAT VARIABLES FROM LIST FALL WITHIN GIVEN LIMITS
- \* FILE NO. 104 ON THIS TAPE IS  
• LINE (709) FAST ARBITRARY STRAIGHT LINE SEGMENT ON SCOPE
- \* FILE NO. 105 ON THIS TAPE IS  
• LINE (7090) FAST ARBITRARY STRAIGHT LINE SEGMENT ON SCOPE
- \* FILE NO. 106 ON THIS TAPE IS  
• LINEF (709) PLOT FAST HORIZONTAL LINE ON SCOPE
- \* FILE NO. 107 ON THIS TAPE IS  
• LINEF(7090) PLOT FAST HORIZONTAL LINE ON SCOPE
- \* FILE NO. 108 ON THIS TAPE IS  
• LINEV (709) PLOT FAST VERTICAL LINE ON SCOPE

Listing of first file of Tape 1 of  
Program Set II (Page 5 of 5)

- \* FILE NO. 109 ON THIS TAPE IS
- \* LINEV(7090) PLOT FAST VERTICAL LINE ON SCOPE
- \* FILE NO. 110 ON THIS TAPE IS
- \* LINTR1 LINEAR INTERPOLATION IN A TABLE
- \* FILE NO. 111 ON THIS TAPE IS
- \* LISTNG LIST AUXILIARY INFORMATION FOR AN INDATA-OUTDATA TYPE TAPE
- \* FILE NO. 112 ON THIS TAPE IS
- \* LOC CORE LOCATION WITH INDEXABLE ARGUMENT
- \* FILE NO. 113 ON THIS TAPE IS
- \* LOCATE LOCATE AND OPERATE SUBROUTINES BY PROXY CALL STATEMENTS
- \* FILE NO. 114 ON THIS TAPE IS
- \* LSHFT LOGICAL SHIFT FUNCTION
- \* FILE NO. 115 ON THIS TAPE IS
- \* LSLINE LEAST SQUARES LINE
- \* FILE NO. 116 ON THIS TAPE IS
- \* LSSSI LEAST SQUARES SHAPER BY SIDEWAYS ITERATION
- \* FILE NO. 117 ON THIS TAPE IS
- \* MATINV INVERSE OF A MATRIX
- \* FILE NO. 118 ON THIS TAPE IS
- \* END TAPE CARD IN FORMAT(1H\*,6X,8HEND TAPE)

Listing of first file of Tape 2 of  
Program Set II (Page 1 of 6)

*	TABLE OF CONTENTS
*	FILE NO. 1 ON THIS TAPE IS
*TABLE OF CONTENTS	
*	FILE NO. 2 ON THIS TAPE IS
*MATML1	SQUARE MATRIX MULTIPLICATION
*	FILE NO. 3 ON THIS TAPE IS
*MATML3	N X M MATRIX BY M X L MATRIX MULTIPLICATION
*	FILE NO. 4 ON THIS TAPE IS
*MATRA	MATRIX TRANSPOSE
*	FILE NO. 5 ON THIS TAPE IS
*MATRA1	SQUARE MATRIX TRANSPOSE
*	FILE NO. 6 ON THIS TAPE IS
*MAXSN	FIND SIGNED OR UNSIGNED EXTREMAL VALUES OF A VECTOR
*	FILE NO. 7 ON THIS TAPE IS
*MAXSAM	EXTREMAL VALUES OF MATRIX ELEMENTS
*	FILE NO. 8 ON THIS TAPE IS
*MDOT	DOT PRODUCT OR REVERSED DOT PRODUCT OF VECTORS OF MATRICES
*	FILE NO. 9 ON THIS TAPE IS
*MDCT3	DOT PRODUCT OR REVERSED DOT PRODUCT OF VECTORS OF MATRICES
*	FILE NO. 10 ON THIS TAPE IS
*MEMUSE	OFF-LINE PRINT OF MEMORY USAGE - PROGRAM AND COMMON
*	FILE NO. 11 ON THIS TAPE IS
*MFACT	FACTOR A SYMMETRIC POSITIVE DEFINITE MATRIX
*	FILE NO. 12 ON THIS TAPE IS
*MIFLS	MULTI-INPUT FILTER BY LEAST SQUARES
*	FILE NO. 13 ON THIS TAPE IS
*MIPLS	MULTI-INPUT PREDICTOR BY LEAST SQUARES
*	FILE NO. 14 ON THIS TAPE IS
*MISS	MULTI-INPUT SIDEWARDS ITERATION
*	FILE NO. 15 ON THIS TAPE IS
*MLISCL	MULTIPLY AN MLI VECTOR BY A FORTRAN FIXED POINT INTEGER
*	FILE NO. 16 ON THIS TAPE IS
*MLI2A6	CONVERT MACHINE LANGUAGE INTEGER TO EQUIVALENT HOLLERITH
*	FILE NO. 17 ON THIS TAPE IS
*MONOCK	CHECK VECTOR FOR MONOTONE INCREASING OR DECREASING BEHAVIOR
*	FILE NO. 18 ON THIS TAPE IS
*MOUT	MATRIX OUTPUT IN G FORMAT
*	FILE NO. 19 ON THIS TAPE IS
*MOUTAI	OUTPUT A MATRIX AS INTEGERS DENSELY PACKED OFF-LINE
*	FILE NO. 20 ON THIS TAPE IS
*MOVE	MOVE A VECTOR TO A DIFFERENT LOCATION
*	FILE NO. 21 ON THIS TAPE IS
*MOVECS	MOVE AN ARBITRARY SET OF VECTORS
*	FILE NO. 22 ON THIS TAPE IS
*MOVREV	MOVE, REVERSE, CHANGE SPACING, OR CHANGE SIGN OF A VECTOR
*	FILE NO. 23 ON THIS TAPE IS
*MPSEC1	MAP A SEQUENCE OF NUMBERS INTO AN INTEGER SERIES
*	FILE NO. 24 ON THIS TAPE IS
*MRVRS	REVERSE VECTOR OF MATRICES
*	FILE NO. 25 ON THIS TAPE IS
*MSCON1	MEAN SQUARE CONTINGENCY AND DEPENDENCY FROM PROBABILITY DENSITY
*	FILE NO. 26 ON THIS TAPE IS
*MULK ~II	MULTIPLY ANY NO. OF VARIABLES BY A SINGLE FLTC. PT. CONSTANT
*	FILE NO. 27 ON THIS TAPE IS
*MULLER	POLYNOMIAL ROOT FINDER

Listing of first file of Tape 2 of  
Program Set II (Page 2 of 6)

- \* FILE NO. 28 ON THIS TAPE IS  
\* MULPLY MULTIPLY VECTOR BY FLOATING OR FIXED CONSTANT
- \* FILE NO. 29 ON THIS TAPE IS  
\* MUVACD FAST MOVING SUMMATION OF A FIXED POINT VECTOR
- \* FILE NO. 30 ON THIS TAPE IS  
\* MVBLCK MOVE DATA BLOCK
- \* FILE NO. 31 ON THIS TAPE IS  
\* MVINAV MOVING AVERAGE OF A VECTOR
- \* FILE NO. 32 ON THIS TAPE IS  
\* MVNSLM MOVING SUMMATION WITH DIVISION BY A CONSTANT
- \* FILE NO. 33 ON THIS TAPE IS  
\* MVNTIN MOVING TRAPEZOIDAL INTEGRAL OR ABSOLUTE VALUE INTEGRAL
- \* FILE NO. 34 ON THIS TAPE IS  
\* MVSQAV MOVING MEAN SQUARE AVERAGE OF A VECTOR
- \* FILE NO. 35 ON THIS TAPE IS  
\* MXRARE REGION TO MAXIMIZE RATIO OF TWO DISTRIBUTION FUNCTIONS
- \* FILE NO. 36 ON THIS TAPE IS  
\* NMZMG1 NORMALIZE A VECTOR TO GIVEN MAXIMUM VALUE
- \* FILE NO. 37 ON THIS TAPE IS  
\* NPOINT1 NORMAL DISTRIBUTION AND DIVISION INTO EQUALLY LIKELY SECTIONS
- \* FILE NO. 38 ON THIS TAPE IS  
\* NRMVEC NORMALIZE AND CHANGE MEAN OF A VECTOR
- \* FILE NO. 39 ON THIS TAPE IS  
\* NTHA RETURN N-TH ARGUMENT BEYOND THE FIRST
- \* FILE NO. 40 ON THIS TAPE IS  
\* NURINC CREATE ONE VECTOR FROM ANOTHER WITH NEW RANGE AND INCREMENT
- \* FILE NO. 41 ON THIS TAPE IS  
\* NXALRM SCAN VECTOR FOR POSSIBLE BLOCK OF VALUES ALL ABOVE GIVEN LEVEL
- \* FILE NO. 42 ON THIS TAPE IS  
\* ONLINE OPTIONAL ONLINE MONITOR OF BCD TAPE WRITING
- \* FILE NO. 43 ON THIS TAPE IS  
\* OUCATA FAST AND CONVENIENT DATA STORAGE ON TAPE
- \* FILE NO. 44 ON THIS TAPE IS  
\* PACDAT READ EVERY N-TH WORD FROM BINARY TAPE
- \* FILE NO. 45 ON THIS TAPE IS  
\* PAKN SCALE AND FIX DATA VECTOR, PACK N DATA POINTS PER REGISTER
- \* FILE NO. 46 ON THIS TAPE IS  
\* PLANSF FAST TWO-DIMENSIONAL SPATIAL SPECTRUM
- \* FILE NO. 47 ON THIS TAPE IS  
\* PLCTVS PRINTER-PLOT OF ARBITRARY SET OF VECTORS
- \* FILE NO. 48 ON THIS TAPE IS  
\* PLTVS1 PRINTER PLOT OF A SET OF EQUAL LENGTH VECTORS
- \* FILE NO. 49 ON THIS TAPE IS  
\* PLURNS PLURALIZE THE NEXT SUBROUTINE
- \* FILE NO. 50 ON THIS TAPE IS  
\* PLYSYN POLYNOMIAL SYNTHESIZED FROM ITS REAL AND COMPLEX ROOTS
- \* FILE NO. 51 ON THIS TAPE IS  
\* POKCT1 EVALUATION OF INTEGER SEQUENCE IN GROUPS OF FIVE AS POKER HANDS
- \* FILE NO. 52 ON THIS TAPE IS  
\* POLYCV PERFORM LONG DIVISION OF TWO POLYNOMIALS
- \* FILE NO. 53 ON THIS TAPE IS  
\* POLYEV EVALUATE A POLYNOMIAL WITH REAL COEFFICIENTS FOR REAL ARGUMENT
- \* FILE NO. 54 ON THIS TAPE IS  
\* POLYSN POLYNOMIAL SYNTHESIS FROM REAL AND COMPLEX ROOTS

Listing of first file of Tape 2 of  
Program Set II (Page 3 of 6)

- \* FILE NO. 55 ON THIS TAPE IS RAISE VECTOR TO POWER OR SUM POWER OF DEVIATIONS FROM BASE
- \* FILE NO. 56 ON THIS TAPE IS GENERATE PROBABILITY DISTRIBUTION WITH SPECIFIED MOMENTS
- \* FILE NO. 57 ON THIS TAPE IS SECOND PROBABILITY DENSITY OF INTEGER SERIES AT GIVEN LAG
- \* FILE NO. 58 ON THIS TAPE IS FAST CORRELATIONS FOR LONG SERIES OF FIXED POINT INTEGERS
- \* FILE NO. 59 ON THIS TAPE IS FIND THE POWER SERIES SQUARE ROOT OF A POLYNOMIAL
- \* FILE NO. 60 ON THIS TAPE IS PRINT OR WRITE OUTPUT TAPE A MACHINE LANGUAGE INTEGER VECTOR
- \* FILE NO. 61 ON THIS TAPE IS FAST AUTOCORRELATIONS FOR LONG, LIMITED ACCURACY SERIES
- \* FILE NO. 62 ON THIS TAPE IS FAST CONVOLUTIONS FOR LONG, LIMITED ACCURACY SERIES
- \* FILE NO. 63 ON THIS TAPE IS FAST FOURIER TRANSFORM OF TRANSIENT WITH ARBITRARY TIME ORIGIN
- \* FILE NO. 64 ON THIS TAPE IS QUICK INVERSE FOURIER TRANSFORM WITH ARBITRARY TIME ORIGIN
- \* FILE NO. 65 ON THIS TAPE IS QUADRATIC INTERPOLATION IN A TABLE
- \* FILE NO. 66 ON THIS TAPE IS FIND QUADRATIC WHICH EXACTLY FITS 3 EQUALLY SPACED POINTS
- \* FILE NO. 67 ON THIS TAPE IS FAST CROSS-CORRELATIONS FOR LONG, LIMITED ACCURACY SERIES
- \* FILE NO. 68 ON THIS TAPE IS QUICK CROSSCORRELATION OF MLI TRANSIENTS
- \* FILE NO. 69 ON THIS TAPE IS READ DATA IN GENERALIZED FORMAT
- \* FILE NO. 70 ON THIS TAPE IS REFLECT A FIXED OR FLOATING VECTOR THROUGH A CONSTANT
- \* FILE NO. 71 ON THIS TAPE IS REMOVE THE MEAN FROM A FLOATING VECTOR
- \* FILE NO. 72 ON THIS TAPE IS REREAD DATA RECORD AND END FILE MONITOR
- \* FILE NO. 73 ON THIS TAPE IS REVERSE A VECTOR ELSEWHERE OR IN PLACE
- \* FILE NO. 74 ON THIS TAPE IS FAST REVERSE STORAGE ORDER OF A VECTOR
- \* FILE NO. 75 ON THIS TAPE IS REALIZABLE LEAST SQUARES PREDICTOR BY RECURSION, 1-DIMENSION
- \* FILE NO. 76 ON THIS TAPE IS REALIZABLE LEAST SQUARES PREDICTOR BY RECURSION, 2-DIMENSIONS
- \* FILE NO. 77 ON THIS TAPE IS REALIZABLE LEAST SQUARES SHAPER BY RECURSION
- \* FILE NO. 78 ON THIS TAPE IS K.M.S. DEVIATION FROM GIVEN BASE OR FROM TRUE AVERAGE
- \* FILE NO. 79 ON THIS TAPE IS ROUND FLTG. PT. NO. UP, DOWN, OR TO NEAREST FLTG. PT. INTEGER
- \* FILE NO. 80 ON THIS TAPE IS ROUND, ROUND UP, OR ROUND DOWN A FLOATING VECTOR
- \* FILE NO. 81 ON THIS TAPE IS ROTATE CENTRO-SYMMETRIC O- TISYMMETRIC 2-DIMENSIONAL ARRAY

Listing of first file of Tape 2 of  
Program Set II (Page 4 of 6)

- \* ROTAT1 FILE NO. 82 ON THIS TAPE IS ROTATE A VECTOR UPWARDS OR DOWNWARDS AN ARBITRARY AMOUNT
- \* RPLFMT FILE NO. 83 ON THIS TAPE IS REPLACE THE FORMAT OF A SUCCEEDING INPUT OR OUTPUT STATEMENT
- \* RSKIP FILE NO. 84 ON THIS TAPE IS SKIP FORWARD OR BACKWARD OVER RECORDS ON TAPE
- \* SAME FILE NO. 85 ON THIS TAPE IS ENABLE MIXED EXPRESSIONS IN FORTRAN
- \* SCPSCL FILE NO. 86 ON THIS TAPE IS SCALE VECTOR TO INTEGERS FOR SCOPE, CLIPPING EXCESSIVE VALUES
- \* SEARCH FILE NO. 87 ON THIS TAPE IS SEARCH A VECTOR FOR A VALUE
- \* FILE NO. 88 ON THIS TAPE IS
- \* SEQSAC FILE NO. 89 ON THIS TAPE IS FAST FUNCTIONS FOR SEQUENTIAL SINES AND COSINES
- \* SETINO FILE NO. 90 ON THIS TAPE IS INITIALIZE FOR ADDING TO AN INDATA-OUTDATA TAPE
- \* SETK FILE NO. 91 ON THIS TAPE IS SET VARIABLES OR VECTORS TO GIVEN VALUES
- \* SETK -II FILE NO. 92 ON THIS TAPE IS SET ANY NO. OF VARIABLES EQUAL TO A SINGLE VALUE (FXD OR FLTG)
- \* SETKP FILE NO. 93 ON THIS TAPE IS PLURALIZED FORMS OF SUBROUTINES SETK AND SETVEC
- \* SETKS -II FILE NO. 94 ON THIS TAPE IS SET ANY NO. OF VARIABLES EQUAL TO SEPARATE VALUES (FXD OR FLTG)
- \* SETKV FILE NO. 95 ON THIS TAPE IS SET ALL ELEMENTS OF VECTOR EQUAL TO A CONSTANT (ANY MODE)
- \* SETKVS FILE NO. 96 ON THIS TAPE IS SET ANY NO. OF VECTORS EQUAL TO SEPARATE VALUES (FXD OR FLTG)
- \* SETLIN FILE NO. 97 ON THIS TAPE IS SET FXD OR FLTG VECTOR EQUAL TO A LINEAR SEGMENT
- \* SETLNS FILE NO. 98 ON THIS TAPE IS SET LINEAR VECTORS, FIXED AND/OR FLOATING
- \* SEVRAL FILE NO. 99 ON THIS TAPE IS OPERATE SEVERAL SUBROUTINES OR ONE SUBROUTINE REPEATEDLY
- \* SHFTR1 FILE NO. 100 ON THIS TAPE IS SHIFT VECTOR ELEMENTS ARITHMETICALLY LEFT OR RIGHT
- \* SHFTR2 FILE NO. 101 ON THIS TAPE IS SHIFT VECTOR ELEMENTS LOGICALLY LEFT OR RIGHT
- \* SHUFFL FILE NO. 102 ON THIS TAPE IS SHUFFLE A LIST OF INTEGERS FROM 1 TO N
- \* SIFT FILE NO. 103 ON THIS TAPE IS FORM A VECTOR BY SIFTING ANOTHER AT EVEN INCREMENTS
- \* SIMEC FILE NO. 104 ON THIS TAPE IS SOLUTION OF SIMULTANEOUS EQUATIONS AND DETERMINANT EVALUATION
- \* SIZELP FILE NO. 105 ON THIS TAPE IS FAST MAKE INDEX (BY INCREASING SIZE) OF ELEMENTS IN A VECTOR
- \* SMPSCN FILE NO. 106 ON THIS TAPE IS UNSCALE OR SCALE VECTOR FOR SIMPSON INTEGRAL AND/OR INTEGRATE
- \* SPCOR2 FILE NO. 107 ON THIS TAPE IS SPATIAL CROSSCORRELATION OF 2-DIMENSIONAL SPATIAL ARRAYS
- \* SPLIT FILE NO. 108 ON THIS TAPE IS SPLIT A VECTOR INTO ITS EVEN AND ODD PARTS (OR INVERSE)
- \* SQRDIF FILE NO. 109 ON THIS TAPE IS SUM SQUARE DIF. OF FLTG VECTOR FROM ANOTHER OR FROM A CONSTANT

Listing of first file of Tape 2 of  
Program Set II (Page 5 of 6)

- \* FILE NO. 109 ON THIS TAPE IS FAST SQUARE ELEMENTS OF A MACHINE LANGUAGE INTEGER VECTOR
- \* FILE NO. 110 ON THIS TAPE IS
- \* SQROCT      SQUARE ROOT OF A FLOATING VECTOR
- \* FILE NO. 111 ON THIS TAPE IS
- \* SQRSLM      SUM THE SQUARED ELEMENTS OF A FLTG OR FXD VECTOR
- \* FILE NO. 112 ON THIS TAPE IS
- \* SQUARE      SQUARE ELEMENTS OF FXD OR FLTG VECTOR
- \* FILE NO. 113 ON THIS TAPE IS
- \* SRCH1      SEARCH VECTOR FOR NUMBER, STARTING FROM FIRST OR LAST TERM
- \* FILE NO. 114 ON THIS TAPE IS
- \* STZ      FAST SET VECTOR TO ZERO
- \* FILE NO. 115 ON THIS TAPE IS
- \* STZS      SET A LIST OF VECTORS TO ZERO
- \* FILE NO. 116 ON THIS TAPE IS
- \* SUM      SUM ELEMENTS OF FLOATING OR FIXED VECTOR
- \* FILE NO. 117 ON THIS TAPE IS
- \* SUMDFR      SUM DIFFERENCE OF VECTOR FROM ANOTHER OR FROM A CONSTANT
- \* FILE NO. 118 ON THIS TAPE IS
- \* SWITCH      TEST THE CONDITION OF ANY SENSE SWITCH
- \* FILE NO. 119 ON THIS TAPE IS
- \* TAMVL      TRIANGULAR AVERAGING, MOVING LEFT OR RIGHT END
- \* FILE NO. 120 ON THIS TAPE IS
- \* TIMA2B (7094) REAL TIME, TO SPECIFIED ACCURACY, OF GIVEN PROGRAM RANGE
- \* FILE NO. 121 ON THIS TAPE IS
- \* TIMSLB      FIND OPERATION TIME OF NEXT SUBROUTINE TO GIVEN ACCURACY
- \* FILE NO. 122 ON THIS TAPE IS
- \* TINGL      DEFINITE TRAPEZOIDAL INTEGRAL OF FUNCTION OR ITS MAGNITUDE
- \* FILE NO. 123 ON THIS TAPE IS
- \* TRMINO      TERMINATE AN INDATA-OUTDATA TAPE
- \* FILE NO. 124 ON THIS TAPE IS
- \* UNPAKN      UNPACK AND RESCALE A PACKED DATA VECTOR
- \* FILE NO. 125 ON THIS TAPE IS
- \* VARARG      ENABLE FORTRAN VARIABLE LENGTH CALLING SEQUENCES
- \* FILE NO. 126 ON THIS TAPE IS
- \* VDOTV      DOT PRODUCT OF TWO VECTORS WITH DIVISION BY CONSTANT
- \* FILE NO. 127 ON THIS TAPE IS
- \* VDVBYV      DIVIDE ELEMENTS OF ONE VECTOR BY THOSE OF ANOTHER
- \* FILE NO. 128 ON THIS TAPE IS
- \* VECOLT      OFFLINE VECTOR OUTPUT WITH NORMAL OR LITERAL FORMAT
- \* FILE NO. 129 ON THIS TAPE IS
- \* VOUT      OUTPUT NAMED VECTOR BY NORMAL OR LITERAL FORMAT WITH SPACING
- \* FILE NO. 130 ON THIS TAPE IS
- \* VPLUSV      ADD OR SUBTRACT TWO FLOATING OR FIXED VECTORS
- \* FILE NO. 131 ON THIS TAPE IS
- \* VRSOLT      OUTPUT VARIABLES BY NORMAL OR LITERAL FORMAT
- \* FILE NO. 132 ON THIS TAPE IS
- \* VSOUT      OUTPUT NAMED VECTORS BY NORMAL OR LITERAL FORMATS WITH SPACING
- \* FILE NO. 133 ON THIS TAPE IS
- \* VTIMSV      MULTIPLY ELEMENTS OF TWO VECTORS FIXED OR FLOATING
- \* FILE NO. 134 ON THIS TAPE IS
- \* WAC      WIENER AUTOCORRELATION
- \* FILE NO. 135 ON THIS TAPE IS
- \* WHICH      CHOOSE BETWEEN TWO VARIABLES BY A THIRD ONE BEING ZERO

Listing of first file of Tape 2 of  
Program Set II (Page 6 of 6)

- \* WLLSFP FILE NO. 136 ON THIS TAPE IS WIENER-LEVINSON LEAST SQUARE ERROR FILTER OR PREDICTOR
- \* WRTOAT FILE NO. 137 ON THIS TAPE IS WRITE BINARY DATA ON TAPE
- \* FILE NO. 138 ON THIS TAPE IS
- \* XACTEQ SIGN OF DIFFERENCE OF 2 VARIABLES OR 0 IF SAME INCLUDING SIGN
- \* FILE NO. 139 ON THIS TAPE IS
- \* XAVRGE FIND AVERAGE OF FIXED PT VECTOR
- \* FILE NO. 140 ON THIS TAPE IS
- \* XDIV FWD PT DIVIDE WITH TRUNCATION OR ROUNDING TO FORTRAN-II INTEGER
- \* FILE NO. 141 ON THIS TAPE IS
- \* XDVICE DIVIDE A FWD VECTOR BY A CONSTANT
- \* FILE NO. 142 ON THIS TAPE IS
- \* XFIXM TRUNCATE OR ROUND FLOATING PT. NUMBER TO MACHINE INTEGER
- \* FILE NO. 143 ON THIS TAPE IS
- \* XLCOMM FIND LENGTH OF COMMON STORAGE
- \* FILE NO. 144 ON THIS TAPE IS
- \* XLIMIT FIND IF ARGUMENT FALLS INSIDE TWO LIMITING VALUES
- \* FILE NO. 145 ON THIS TAPE IS
- \* XLCCV CREATE VECTOR OF MACHINE ADDRESSES OF VARIABLES IN A LIST
- \* FILE NO. 146 ON THIS TAPE IS
- \* XOCZE DETERMINE WHETHER FORTRAN-II INTEGER IS EVEN OR ODD
- \* FILE NO. 147 ON THIS TAPE IS
- \* XREMAV REMOVE THE MEAN FROM A FIXED VECTOR
- \* FILE NO. 148 ON THIS TAPE IS
- \* XSPECT FAST COSINE, SINE TRANSFORMS OF CROSS-CORRELATION FUNCTIONS
- \* FILE NO. 149 ON THIS TAPE IS
- \* XSQDFR SUM SQUARE DIF. OF FWD. VECTOR FROM ANOTHER OR FROM A CONSTANT
- \* FILE NO. 150 ON THIS TAPE IS
- \* XSQRUT SQUARE ROOT OF A FIXED VECTOR WITH ROUNDING
- \* FILE NO. 151 ON THIS TAPE IS
- \* XVCVEV DIVIDE ELEMENTS OF TWO FIXED VECTORS WITH OR WITHOUT ROUNDING
- \* FILE NO. 152 ON THIS TAPE IS
- \* ZEFBCD TEST IF NEXT TAPE RECORD IS END OF FILE AND REPOSITION TAPE
- \* FILE NO. 153 ON THIS TAPE IS
- \* END TAPE CARD IN FORMAT(1H\*,6X,8HEND TAPE)

### 3. Program Statistics

All of the programs of Set II are subroutines or functions, and the name of each program coincides with the name of the entry point to the subroutine or function. In the case of multiple-entry routines the name of the program coincides with that of the first entry card in the deck, and is called the "principal entry". The total count of principal and secondary entries is 395.

The program statistics tabulation which follows provides an alphabetical listing of all entries, with their secondary entries, transfer vectors, storage requirements, acceptance dates of symbolic deck, symbolic deck card counts, binary card counts, authors, and language. The symbol "M" is used for machine language (i.e. FAP), and "F" for FORTRAN. Authors are coded by initials as follows.

AMN	Arcadio M. Niell
CP	Cheh Pan
EAR	Enders A. Robinson
IH	Ira Hanson
JC	Jacqueline Clark
JFC	Jon F. Claerbout
JNG	James N. Galbraith, Jr.
JTO	J. T. Olsztyń
JTP	Joseph T. Procito, Jr.
MIT	MIT Lincoln Lab or Computation Center Staff
RAW	Ralph A. Wiggins
RJG	Roy J. Greenfield
SMS	Stephen M. Simpson, Jr.

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\* ABSVAL TO ARBCOL \*  
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PROGRAM STATISTICS

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\* ABSVAL TO ARBCOL \*  
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ENTRY	S E C O N D A R Y	T R A N S F E R R I E S	.	S T O R A G E	.	D A T E	S Y M B O L I C	C O D E	S C O U N T	B C O U N T	A O U T	L A N G U A G E
ADANL	.	.	.	.	.	.	.	.	.	.	.	.
XDANL	.	SIN	.	.	.	.	.	.	.	.	.	.
ADANX	.	.	.	.	.	.	.	.	.	.	.	.
XDANX	.	.	.	.	.	.	.	.	.	.	.	.
ADANX (SEE ADANL)	.	.	.	.	.	.	.	.	.	.	.	.
ADDK	.	.	114	.	9/29/64	.	366	.	8	.	SMS	M
SUBK	.	.	.	.	.	.	.	.	.	.	.	.
MULK	.	.	.	.	.	.	.	.	.	.	.	.
DIVK	.	.	.	.	.	.	.	.	.	.	.	.
XADDK	.	.	.	.	.	.	.	.	.	.	.	.
XSUSK	.	.	.	.	.	.	.	.	.	.	.	.
XMULK	.	.	.	.	.	.	.	.	.	.	.	.
XDIVK	.	.	.	.	.	.	.	.	.	.	.	.
XDVRK	.	.	.	.	.	.	.	.	.	.	.	.
ADDKS	.	.	.	.	.	.	.	.	.	.	.	.
SUBKS	.	.	.	.	.	.	.	.	.	.	.	.
MULKS	.	.	.	.	.	.	.	.	.	.	.	.
DIVKS	.	.	.	.	.	.	.	.	.	.	.	.
XADDKS	.	.	.	.	.	.	.	.	.	.	.	.
XSUBKS	.	.	.	.	.	.	.	.	.	.	.	.
XMULKS	.	.	.	.	.	.	.	.	.	.	.	.
XDIVKS	.	.	.	.	.	.	.	.	.	.	.	.
XDVRK	.	.	.	.	.	.	.	.	.	.	.	.
ADDKS (SEE ADDK)	.	.	.	.	.	.	.	.	.	.	.	.
AMPHZ	.	.	149	.	10/ 1/64	.	251	.	10	.	JFC	M
REIM	.	ATAN	.	.	.	.	.	.	.	.	.	.
.	SQRT	.	.	.	.	.	.	.	.	.	.	.
.	RND	.	.	.	.	.	.	.	.	.	.	.
.	COS	.	.	.	.	.	.	.	.	.	.	.
.	SIN	.	.	.	.	.	.	.	.	.	.	.
ARBCOL	.	.	129	.	9/ 9/64	.	271	.	8	.	SMS	M
.	INTOPR	.	.	.	.	.	.	.	.	.	.	.

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\* ARCTAN TO CMPARP \*  
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PROGRAM STATISTICS

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\* ARCTAN TO CMPARP \*  
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ARCTAN	.	29	.	9/ 4/64	.	92	.	3	.	RAW	.	M
.	ATAN	.	.	.	.	.	.	.	.	.	.	.
ARG	(SEE LOCATE)	.	.	.	.	.	.	.	.	.	.	.
ASPECT	.	278	.	9/29/64	.	536	.	15	.	SMS	.	M
.	COLAPS	.	.	.	.	.	.	.	.	.	.	.
.	COSP	.	.	.	.	.	.	.	.	.	.	.
.	DUBLX	.	.	.	.	.	.	.	.	.	.	.
.	DUBLL	.	.	.	.	.	.	.	.	.	.	.
.	SPLIT	.	.	.	.	.	.	.	.	.	.	.
.	RVPRTS	.	.	.	.	.	.	.	.	.	.	.
ASPEC2	.	74	.	3/15/65	.	206	.	5	.	SMS	.	M
.	SEQSAC	.	.	.	.	.	.	.	.	.	.	.
.	NEXCOS	.	.	.	.	.	.	.	.	.	.	.
AVRAGE	.	24	.	9/29/64	.	79	.	3	.	SMS	.	M
BLKSUM	.	49	.	9/ 4/64	.	169	.	4	.	SMS	.	M
BOOST	.	34	.	9/29/64	.	147	.	3	.	SMS	.	M
XBOOST	.	.	.	.	.	.	.	.	.	.	.	.
DPRESS	.	.	.	.	.	.	.	.	.	.	.	.
XDPRSS	.	.	.	.	.	.	.	.	.	.	.	.
CALL	(SEE LOCATE)	.	.	.	.	.	.	.	.	.	.	.
CALL2	(SEE LOCATE)	.	.	.	.	.	.	.	.	.	.	.
CARIGE	.	47	.	9/29/64	.	98	.	4	.	SMS	.	F
.	(STH)	.	.	.	.	.	.	.	.	.	.	.
.	(FIL)	.	.	.	.	.	.	.	.	.	.	.
CHISQR	.	105	.	9/29/64	.	85	.	6	.	JNG	.	F
CHOOSE	.	17	.	9/ 4/64	.	84	.	2	.	SMS	.	M
CHPRTS	.	76	.	9/29/64	.	149	.	5	.	SMS	.	M
RVPRTS	.	.	.	.	.	.	.	.	.	.	.	.
CHSIGN	.	18	.	9/29/64	.	78	.	2	.	SMS	.	M
CHUSET	(SEE INDEX)	.	.	.	.	.	.	.	.	.	.	.
CLKON	.	46	.	9/29/64	.	42	.	4	.	RAW	.	F
.	CLOCK1	.	.	.	.	.	.	.	.	.	.	.
.	(SPH)	.	.	.	.	.	.	.	.	.	.	.
.	(FIL)	.	.	.	.	.	.	.	.	.	.	.
CLOCK1 (7090)	.	57	.	3/15/65	.	148	.	4	.	SMS	.	M
CMPARL	(SEE CMPARV)	.	.	.	.	.	.	.	.	.	.	.
CMPARP	.	53	.	9/29/64	.	151	.	4	.	SMS	.	M
CMPARS	.	.	.	.	.	.	.	.	.	.	.	.

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\* CMPARS TO COSISP \*  
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PROGRAM STATISTICS

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\* CMPARS TO COSISP \*  
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CMPARS (SEE CMPARP)	.	.	.	.	.	.	.	.
CMPARV	.	50	9/ 4/64	156	4	SMS	.	N
CMPARL	.	.	.	.	.	.	.	.
CMPRA	.	18	9/ 4/64	104	2	RAW	.	M
XCMPPRA	.	.	.	.	.	.	.	.
CMPPRFL	.	.	.	.	.	.	.	.
CMPPRFL (SEE CMPRA)	.	.	.	.	.	.	.	.
CNTRDB	.	550	9/ 9/64	251	27	SMS	.	F
SETVEC	.	.	.	.	.	.	.	.
LOG	.	.	.	.	.	.	.	.
CONTUR	.	.	.	.	.	.	.	.
EXP	.	.	.	.	.	.	.	.
SAME	.	.	.	.	.	.	.	.
(STH)	.	.	.	.	.	.	.	.
(FIL)	.	.	.	.	.	.	.	.
CNTROW	.	802	9/ 9/64	521	39	SMS	.	F
RNDDN	.	.	.	.	.	.	.	.
RNDUP	.	.	.	.	.	.	.	.
QUFIT1	.	.	.	.	.	.	.	.
CUFIT1	.	.	.	.	.	.	.	.
FASCUB	.	.	.	.	.	.	.	.
RND	.	.	.	.	.	.	.	.
COLABL	.	185	9/ 4/64	124	10	SMS	.	F
GENHOI	.	.	.	.	.	.	.	.
(SPH)	.	.	.	.	.	.	.	.
(FIL)	.	.	.	.	.	.	.	.
(STH)	.	.	.	.	.	.	.	.
COLAPS	.	50	9/29/64	128	4	JC	.	X
CONTUR	.	587	9/ 9/64	642	29	SMS	.	F
RNDDN	.	.	.	.	.	.	.	.
RNDUP	.	.	.	.	.	.	.	.
(STH)	.	.	.	.	.	.	.	.
(FIL)	.	.	.	.	.	.	.	.
COLABL	.	.	.	.	.	.	.	.
ARBCOL	.	.	.	.	.	.	.	.
CNTRW	.	.	.	.	.	.	.	.
SWITCH	.	.	.	.	.	.	.	.
(SPH)	.	.	.	.	.	.	.	.
XSAME	.	.	.	.	.	.	.	.
CONVLV	.	96	9/29/64	99	6	JFC	.	F
CONVLV-II	.	56	10/ 2/64	149	4	JFC	.	M
.	.	.	.	.	.	RAW	.	.
COSISP (SEE COSPI)	.	.	.	.	.	.	.	.

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\* COSIS1 TO CVSOUT \*  
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PROGRAM STATISTICS

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\* COSIS1 TO CVSOUT \*  
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COSIS1	.	406	9/10/64	264	21	RAW	F
	IXCARG	.	.	.	.	.	.
	SPLIT	.	.	.	.	.	.
	MOVREV	.	.	.	.	.	.
	CHFRTS	.	.	.	.	.	.
	COSP	.	.	.	.	.	.
	SISP	.	.	.	.	.	.
	COSISP	.	.	.	.	.	.
COSP	.	504	9/29/64	878	27	SMS	M
SISP	.	.	.	.	.	.	.
COSISP	.	.	.	.	.	.	.
COSTBL	.	121	9/29/64	200	8	JFC	M
	SINTBL	COS	.	.	.	.	.
	COSTBX	SIN	.	.	.	.	.
	SINTBX	.	.	.	.	.	.
COSTBX (SEE COSTBL)	.	.	.	.	.	.	.
CPYFL2	.	178	9/ 9/64	304	10	RAW	M
	(IOS)	.	.	.	.	.	.
	(TCO)	.	.	.	.	.	.
	(WRS)	.	.	.	.	.	.
	(RCH)	.	.	.	.	.	.
	(TRC)	.	.	.	.	.	.
	(ETT)	.	.	.	.	.	.
	(WEF)	.	.	.	.	.	.
	(BSR)	.	.	.	.	.	.
	(RDS)	.	.	.	.	.	.
CROSS	.	107	9/29/64	87	7	RAW	F
	STZ	.	.	.	.	.	.
	FDOT	.	.	.	.	.	.
CROST	.	134	9/29/64	99	8	RAW	F
	CROSS	.	.	.	.	.	.
	REVERS	.	.	.	.	.	.
CRSVM	.	327	9/10/64	220	17	RAW	F
	SETKS	.	.	.	.	.	.
	MDOT3	.	.	.	.	.	.
	STZ	.	.	.	.	.	.
CSOUT	.	49	9/ 4/64	127	4	RAW	M
	CARIGE	.	.	.	.	.	.
	(STH)	.	.	.	.	.	.
	PRADJ	.	.	.	.	.	.
	(FIL)	.	.	.	.	.	.
CUFIT1	.	158	9/ 4/64	326	9	SMS	M
CVSOUT	.	84	9/29/64	221	6	SMS	M
	CARIGE	.	.	.	.	.	.

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\* CVSOUT TO DUBLX \*  
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PROGRAM STATISTICS

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\* CVSOUT TO DUBLX \*  
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.	FMTOUT	.	.	.	.	.	.	.
.	VECOUT	.	.	.	.	.	.	.
DADECK	.	.	100	9/ 4/64	.	70	.	6 . JNG + F
.	EOFSET	.	.	.	.	.	.	RAW
.	(TSN)	.	.	.	.	.	.	.
.	(RTN)	.	.	.	.	.	.	.
.	(STH)	.	.	.	.	.	.	.
.	(FIL)	.	.	.	.	.	.	.
.	RSKIP	.	.	.	.	.	.	.
DELTA	.	.	17	9/ 4/64	.	141	.	2 . SMS . M
XDELTA	.	.	.	.	.	.	.	.
STEPR	.	.	.	.	.	.	.	.
XSTEPR	.	.	.	.	.	.	.	.
STEPL	.	.	.	.	.	.	.	.
XSTEPL	.	.	.	.	.	.	.	.
STEPC	.	.	.	.	.	.	.	.
XSTEPC	.	.	.	.	.	.	.	.
DERIVA	.	.	61	9/29/64	.	160	.	5 . SMS . M
DETRM (SEE SIMEQ)	.	.	.	.	.	.	.	.
DIFPRS	.	.	30	9/29/64	.	118	.	3 . SMS . M
XDFPRS	.	.	.	.	.	.	.	.
DISPLA (709)	.	220	9/29/64	.	474	.	12 . MIT . M	.
.	(IOH)	.	.	.	.	.	.	.
DISPLA (7090)	.	219	9/ 4/64	.	481	.	13 . MIT . M	.
.	(IOH)	.	.	.	.	.	.	.
.	FRAME	.	.	.	.	.	.	.
DIVIDE	.	23	9/29/64	.	88	.	3 . SMS . M	.
DIVK (SEE ADDK)	.	.	.	.	.	.	.	.
DIVKS (SEE ADDK)	.	.	.	.	.	.	.	.
**DO** (SEE SEVRAL)	.	.	.	.	.	.	.	.
DOTJ	.	59	10/ 2/64	.	143	.	4 . RAW . M	.
DOTF	.	264	9/29/64	.	147	.	14 . RAW . F	.
.	DOTJ	.	.	.	.	.	.	.
DPRESS (SEE BOOST)	.	.	.	.	.	.	.	.
DSPFMT	.	194	9/29/64	.	313	.	11 . SMS . M	.
DUBLI (SEE DUBLX)	.	.	.	.	.	.	.	.
DUBLX	.	45	9/29/64	.	129	.	4 . SMS . M	.
DUBLI	.	.	.	.	.	.	.	.

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• CUBLX TO FLOATM •  
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## PROGRAM STATISTICS

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• DUBLX TO FLOATM •  
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HALVX	.	.	.	.	.	.	.	.
HALVL	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
ENDFI. (SEE REREAD)	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
EOFSET (SEE REREAD)	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
EXCHVS	.	.	22	.	9/29/64	.	84	.
EXPAND	.	.	189	.	9/ 4/64	.	380	.
.	INTOPR	.	.	.	.	.	.	.
FACTOR	.	.	308	.	9/ 8/64	.	489	.
.	MAXAB	.	.	.	.	.	.	.
.	LOG	.	.	.	.	.	.	.
.	COSTBL	.	.	.	.	.	.	.
.	COSP	.	.	.	.	.	.	.
.	EXP	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
FAPSUM	.	.	14	.	9/29/64	.	66	.
FASCN1	.	.	107	.	9/29/64	.	199	.
.	.	.	.	.	.	.	.	.
FASCOR (SEE PROCOR)	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
FASCR1 (SEE PROCOR)	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
FASCUB	.	.	141	.	9/ 4/64	.	260	.
.	.	.	.	.	.	.	.	.
FASEPC (SEE PROCOR)	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
FASEP1 (SEE PROCOR)	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
FASTRK	.	.	26	.	9/ 8/64	.	119	.
FDOT	.	.	40	.	9/ 4/64	.	101	.
FDOTR	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
FDOTR (SEE FDOT)	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
FIRE2	.	.	271	.	9/ 8/64	.	152	.
.	IXCARG	.	.	.	.	.	.	.
.	STZ	.	.	.	.	.	.	.
.	DOTP	.	.	.	.	.	.	.
.	MATML3	.	.	.	.	.	.	.
.	DOTJ	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
FIXV	.	.	35	.	9/29/64	.	105	.
FIXVR	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
FIXVR (SEE FIXV)	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
FLDATA (SEE FXDATA)	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
FLOATM	.	.	25	.	9/29/64	.	91	.
.	.	.	.	.	.	.	.	.

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• FLCATV TO GNHOL2 •  
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PROGRAM STATISTICS

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• FLOATV TO GNHOL2 •  
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FLOATV	.	.	22	.	9/29/64	.	81	.	3	.	SMS	.	M
FMTOUT	.	.	51	.	9/29/64	.	71	.	4	.	SMS	.	F
	.	.	FNDFMT	.	.	.	.	.	.	.	.	.	.
	.	.	RPLFMT	.	.	.	.	.	.	.	.	.	.
	.	.	(STH)	.	.	.	.	.	.	.	.	.	.
	.	.	(FIL)	.	.	.	.	.	.	.	.	.	.
	.	.		.		.	.	.	.	.	.	.	.
FNDFMT	.	.	88	.	9/29/64	.	203	.	6	.	SMS	.	M
	.	.	REVER	.	.	.	.	.	.	.	.	.	.
FRAME (709)	.	.	4	.	9/29/64	.	34	.	2	.	RAW	.	M
FRAME (7090)	.	.	9	.	9/ 4/64	.	47	.	2	.	MIT	.	M
FRQCT1	.	.	117	.	9/29/64	.	95	.	7	.	SMS	.	F
FRQCT2	.	.	117	.	9/29/64	.	212	.	7	.	JNG	.	M
FSKIP	.	.	50	.	9/ 4/64	.	104	.	4	.	JFC	.	M
	.	.	(IOS)	.	.	.	.	.	.	.	.	.	.
	.	.	(RDS)	.	.	.	.	.	.	.	.	.	.
	.	.	(BSR)	.	.	.	.	.	.	.	.	.	.
	.	.	(TC0)	.	.	.	.	.	.	.	.	.	.
	.	.	(TEF)	.	.	.	.	.	.	.	.	.	.
	.	.	(TRC)	.	.	.	.	.	.	.	.	.	.
	.	.		.		.	.	.	.	.	.	.	.
FT24	.	.	777	.	9/29/64	.	848	.	40	.	CP	.	M
	.	.	FXDATA	.	.	.	.	.	.	.	.	.	.
	.	.	FLDATA	.	.	.	.	.	.	.	.	.	.
	.	.		.		.	.	.	.	.	.	.	.
FT24 - II	.	.	818	.	9/29/64	.	147	.	39	.	RAW	.	F
FXDATA	.	.	102	.	10/ 1/64	.	248	.	7	.	SMS	.	M
FLDATA	.	.		.		.	.	.	.	.	.	.	.
GENHOL	.	.	48	.	3/15/65	.	145	.	4	.	RAW	.	M
	.	.	(IOH)	.	.	.	.	.	.	.	.	.	.
GETHOL	.	.	169	.	9/29/64	.	176	.	9	.	SMS	.	F
	.	.	XLOC	.	.	.	.	.	.	.	.	.	.
	.	.	REVERS	.	.	.	.	.	.	.	.	.	.
	.	.		.		.	.	.	.	.	.	.	.
GETRD1	.	.	229	.	10/ 1/64	.	173	.	10	.	SMS	.	F
	.	.	(TSH)	.	.	.	.	.	.	.	.	.	.
	.	.	(RTN)	.	.	.	.	.	.	.	.	.	.
	.	.		.		.	.	.	.	.	.	.	.
GETX	.	.	31	.	9/ 4/64	.	128	.	3	.	RAW	.	M
IGETX	.	.		.		.	.	.	.	.	.	.	.
	.	.		.		.	.	.	.	.	.	.	.
GNFLT1	.	.	232	.	9/29/64	.	164	.	12	.	SMS	.	F
	.	.	COS	.	.	.	.	.	.	.	.	.	.
	.	.		.		.	.	.	.	.	.	.	.
GNHOL2	.	.	74	.	9/29/64	.	158	.	5	.	RAW	.	M
	.	.	(IOH)	.	.	.	.	.	.	.	.	.	.

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• GNHOL2 TO IFNCTN •  
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## PROGRAM STATISTICS

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• GNHOL2 TO IFNCTN •  
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	• (FIL)	.	.	.	.	.	.	.
GRAPH	.	1499	9/29/64	1103	72	SMS	.	F
	• DISPLAY	.	.	.	.	.	.	.
	• (SPH)	.	.	.	.	.	.	.
	• (FIL)	.	.	.	.	.	.	.
	• LINE	.	.	.	.	.	.	.
	• LOG	.	.	.	.	.	.	.
	• EXP12	.	.	.	.	.	.	.
	• XFIXM	.	.	.	.	.	.	.
	• FLOATM	.	.	.	.	.	.	.
	• DSPFMT	.	.	.	.	.	.	.
	• FRAME	.	.	.	.	.	.	.
	• XLOC	.	.	.	.	.	.	.
	• MVBLOCK	.	.	.	.	.	.	.
	• SCPSCL	.	.	.	.	.	.	.
	• HSTPLT	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.
GRAPHX	.	123	9/29/64	154	7	SMS	.	F
	• GRAPH	.	.	.	.	.	.	.
	• FRAME	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.
GRUP2	.	201	10/ 1/64	141	11	JNG	.	F
	.	.	.	.	.	.	.	.
HALVL (SEE DUBLX)	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.
HALVX (SEE DUBLA)	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.
HLADJ	.	46	9/29/64	111	4	SMS	.	M
HRADJ	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.
HRADJ (SEE HLADJ)	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.
HSTPLT	.	145	9/29/64	346	9	JNG	.	M
	• LINEH	.	.	.	.	.	.	.
	• LINEV	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.
HSTPLT-II	.	188	9/29/64	336	11	RAW	.	M
	• LINEH	.	.	.	.	.	.	.
	• LINEV	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.
HSTPLT-III (709)	.	256	9/29/64	438	14	RAW	.	M
	• LINEH	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.
HSTPLT-III (7090)	.	258	9/ 8/64	446	14	RAW	.	M
	• LINEH	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.
MVTOIV	.	39	9/29/64	110	3	SMS	.	M
	.	.	.	.	.	.	.	.
IDERIV	.	54	9/29/64	149	4	SMS	.	M
	.	.	.	.	.	.	.	.
''IF'' (SEE SEVRAL)	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.
IFNCTN	.	208	9/ 4/64	444	12	SMS	.	M
	• MONOCK	.	.	.	.	.	.	.
	• REVER	.	.	.	.	.	.	.

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\* IGETX TO KIINTI \*  
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## PROGRAM STATISTICS

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\* IGETX TO KIINTI \*  
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IGETX (SEE GETX)	.	.	.	.	.	.	.	.
IINTGR	.	.	49	.	9/29/64	.	157	.
INDATA	.	.	896	.	10/ 1/64	.	489	.
.	VARARG	.	.	.	.	.	.	.
.	FSKIP	.	.	.	.	.	.	.
.	(TSB)	.	.	.	.	.	.	.
.	(RLR)	.	.	.	.	.	.	.
.	FAPSUM	.	.	.	.	.	.	.
.	LOC	.	.	.	.	.	.	.
.	MVBLOCK	.	.	.	.	.	.	.
.	XSAME	.	.	.	.	.	.	.
.	(SPH)	.	.	.	.	.	.	.
.	(FIL)	.	.	.	.	.	.	.
.	(STH)	.	.	.	.	.	.	.
.	UNPAKN	.	.	.	.	.	.	.
INDEX	.	.	50	.	9/ 4/64	.	270	.
.	INDEX	.	.	.	.	.	.	.
.	SETEST	.	.	.	.	.	.	.
.	SETAPT	.	.	.	.	.	.	.
.	CHUSET	.	.	.	.	.	.	.
INTGRA	.	.	47	.	9/29/64	.	175	.
INTHOL	.	.	72	.	9/ 9/64	.	156	.
.	FNDFMT	.	.	.	.	.	.	.
.	(IOH)	.	.	.	.	.	.	.
.	(RTN)	.	.	.	.	.	.	.
.	NTMSB (SEE TIMSUB)	.	.	.	.	.	.	.
INTOPR	.	.	111	.	9/ 4/64	.	251	.
INTSUM	.	.	27	.	9/29/64	.	110	.
XNTSUM	.	.	.	.	.	.	.	.
IPLYEV	.	.	98	.	10/ 2/64	.	84	.
.	(IFMP)	.	.	.	.	.	.	.
ITOMLI	.	.	37	.	9/29/64	.	98	.
IVTOHV	.	.	70	.	3/15/65	.	148	.
IXCARG	.	.	35	.	9/29/64	.	67	.
.	XLGC	.	.	.	.	.	.	.
KIINTI	.	.	191	.	9/29/64	.	129	.
.	SQRT	.	.	.	.	.	.	.
.	EXP(3	.	.	.	.	.	.	.
.	NOINTI	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.

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• KOLAPS TO LSSS1 •  
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## PROGRAM STATISTICS

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• KOLAPS TO LSSS1 •  
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KOLAPS	.	.	100	.	9/29/64	.	219	.	6	.	JC	.	M
LIMITS	.	.	44	.	9/ 8/64	.	162	.	4	.	SMS	.	M
LINE (709)	.	.	91	.	9/29/64	.	193	.	6	.	SMS	.	M
LINE (7090)	.	.	95	.	9/ 4/64	.	208	.	6	.	SMS	.	M
LINEH (709)	.	.	34	.	9/29/64	.	158	.	3	.	JNG	.	M
LINEH (7090)	.	.	35	.	9/ 4/64	.	168	.	3	.	JNG	.	M
LINEV (709)	.	.	34	.	9/29/64	.	161	.	3	.	JNG	.	M
LINEV (7090)	.	.	35	.	9/ 4/64	.	169	.	3	.	JNG	.	M
LINIR1	.	.	96	.	9/29/64	.	93	.	6	.	SMS	.	F
LSTNG	.	.	755	.	9/29/64	.	221	.	38	.	RAW	.	F
• (RWT)	.	.	.	.	.	.	.	.	.	.	.	.	.
• (STH)	.	.	.	.	.	.	.	.	.	.	.	.	.
• (FIL)	.	.	.	.	.	.	.	.	.	.	.	.	.
• (TSB)	.	.	.	.	.	.	.	.	.	.	.	.	.
• (RLR)	.	.	.	.	.	.	.	.	.	.	.	.	.
• FAPSUM	.	.	.	.	.	.	.	.	.	.	.	.	.
• SAME	.	.	.	.	.	.	.	.	.	.	.	.	.
• XSAME	.	.	.	.	.	.	.	.	.	.	.	.	.
• (SPH)	.	.	.	.	.	.	.	.	.	.	.	.	.
• FSKIP	.	.	.	.	.	.	.	.	.	.	.	.	.
• SHFTR2	.	.	.	.	.	.	.	.	.	.	.	.	.
•	.	.	.	.	.	.	.	.	.	.	.	.	.
LOC	.	.	4	.	9/29/64	.	54	.	2	.	RAW	.	M
LOCATE	.	.	512	.	3/15/65	.	2008	.	28	.	SMS	.	M
WHERE	.	.	.	.	.	.	.	.	.	.	.	.	.
CALL	.	.	.	.	.	.	.	.	.	.	.	.	.
CALL2	.	.	.	.	.	.	.	.	.	.	.	.	.
SETSBV	.	.	.	.	.	.	.	.	.	.	.	.	.
SETUP	.	.	.	.	.	.	.	.	.	.	.	.	.
RETURN	.	.	.	.	.	.	.	.	.	.	.	.	.
XINDEX	.	.	.	.	.	.	.	.	.	.	.	.	.
ARG	.	.	.	.	.	.	.	.	.	.	.	.	.
XARG	.	.	.	.	.	.	.	.	.	.	.	.	.
STORE	.	.	.	.	.	.	.	.	.	.	.	.	.
XNARGS	.	.	.	.	.	.	.	.	.	.	.	.	.
XNAME	.	.	.	.	.	.	.	.	.	.	.	.	.
•	.	.	.	.	.	.	.	.	.	.	.	.	.
LSHFT	.	.	12	.	9/29/64	.	72	.	2	.	RAW	.	M
XLSHFT	.	.	.	.	.	.	.	.	.	.	.	.	.
LSLINE	.	.	117	.	10/ 1/64	.	82	.	7	.	RAW	.	F
LSSS1	.	.	122	.	9/29/64	.	116	.	7	.	RAW	.	F
• FOOT	.	.	.	.	.	.	.	.	.	.	.	.	.
•	.	.	.	.	.	.	.	.	.	.	.	.	.

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• MATINV TO MINSNM •  
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PROGRAM STATISTICS

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• MATINV TO MINSNM •  
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MATINV	.	90	.	9/29/64	.	79	.	6	.	RAW	.	F
	• SIMEQ	.	.	.	.	.	.	.	.	.	.	.
MATHL1	.	61	.	9/29/64	.	137	.	5	.	RAW	.	M
	.	.	.	.	.	.	.	.	.	.	.	.
MATHL3	.	120	.	9/29/64	.	105	.	7	.	RAW	.	F
	• DOTJ	.	.	.	.	.	.	.	.	.	.	.
MATRA	.	92	.	9/29/64	.	177	.	3	.	RAW	.	M
	.	.	.	.	.	.	.	.	.	SMS	.	.
MATRA1	.	42	.	9/29/64	.	95	.	4	.	RAW	.	M
	.	.	.	.	.	.	.	.	.	.	.	.
MAXAB (SEE MAXSN)	.	.	.	.	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.	.	.	.	.
MAXABM (SEE MAXSNM)	.	.	.	.	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.	.	.	.	.
MAXSN	.	54	.	9/29/64	.	170	.	5	.	JFC	.	M
MINSN	.	.	.	.	.	.	.	.	.	.	.	.
MAXAS	.	.	.	.	.	.	.	.	.	.	.	.
MINAB	.	.	.	.	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.	.	.	.	.
MAXSNM	.	61	.	9/29/64	.	247	.	5	.	SMS	.	M
MINSNM	.	.	.	.	.	.	.	.	.	.	.	.
MAXABM	.	.	.	.	.	.	.	.	.	.	.	.
MINABM	.	.	.	.	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.	.	.	.	.
MDOT	.	109	.	9/29/64	.	94	.	7	.	RAW	.	F
	• MATHL1	.	.	.	.	.	.	.	.	.	.	.
MDOT3	.	122	.	9/29/64	.	120	.	7	.	RAW	.	F
	• MATHL3	.	.	.	.	.	.	.	.	.	.	.
MEMUSE	.	71	.	9/29/64	.	69	.	5	.	SMS	.	F
	• XLCOMM	.	.	.	.	.	.	.	.	.	.	.
	• (STH)	.	.	.	.	.	.	.	.	.	.	.
	• (FIL)	.	.	.	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.	.	.	.	.
MFACT	.	167	.	9/29/64	.	103	.	10	.	RAW	.	F
	• STZ	.	.	.	.	.	.	.	.	.	.	.
	• DOTJ	.	.	.	.	.	.	.	.	.	.	.
	• SQRT	.	.	.	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.	.	.	.	.
MIFLS	.	276	.	9/29/64	.	167	.	14	.	RAW	.	F
	• MOVREV	.	.	.	.	.	.	.	.	.	.	.
	• MATHL3	.	.	.	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.	.	.	.	.
MINAB (SEE MAXSN)	.	.	.	.	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.	.	.	.	.
MINABM (SEE MAXSNM)	.	.	.	.	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.	.	.	.	.
MINSN (SEE MAXSN)	.	.	.	.	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.	.	.	.	.
MINSNM (SEE MAXSNM)	.	.	.	.	.	.	.	.	.	.	.	.
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• MIPLS TO MULK •  
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PROGRAM STATISTICS

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• MIPLS TO MULK •  
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MIPLS	.	571	. 9/29/64 .	254	. 28 . RAW . F
	• IXCARG	.	.	.	.
	• MATINV	.	.	.	.
	• MATML3	.	.	.	.
	• MATRA	.	.	.	.
	• MDOT3	.	.	.	.
	• MOVREV	.	.	.	.
	• STZ	.	.	.	.
MISS	.	335	. 10/ 5/64 .	150	. 17 . RAW . F
	• MOVREV	.	.	.	.
	• MATML3	.	.	.	.
	• MDOT3	.	.	.	.
MLISCL	.	47	. 9/29/64 .	115	. 4 . SMS . M
MLI2A6	.	128	. 9/29/64 .	218	. 8 . SMS . M
MONOCK	.	48	. 9/ 4/64 .	165	. 4 . SMS . M
MOUT	.	130	. 9/ 8/64 .	101	. 8 . RAW . F
	• CARIGE	.	.	.	.
	• (STH)	.	.	.	.
	• (FIL)	.	.	.	.
MOUTAI	.	357	. 9/ 4/64 .	295	. 18 . SMS . F
	• EXP(2	.	.	.	.
	• CARIGE	.	.	.	.
	• GNHOL2	.	.	.	.
	• MAXABM	.	.	.	.
	• LOG	.	.	.	.
	• RND	.	.	.	.
	• (STH)	.	.	.	.
	• (FIL)	.	.	.	.
	• SAME	.	.	.	.
	• MOVE	.	.	.	.
	• MULPLY	.	.	.	.
	• FIXVR	.	.	.	.
MOVE	.	32	. 9/29/64 .	92	. 3 . JFC . M
MOVECS	.	24	. 9/29/64 .	106	. 3 . SMS . M
	• MOVE	.	.	.	.
MOVREV	.	74	. 9/29/64 .	156	. 5 . RAW . M
MPSEQ1	.	110	. 9/29/64 .	197	. 7 . JNC . M
MRVRS	.	61	. 9/29/64 .	67	. 4 . RAW . F
	• REVERS	.	.	.	.
MSCON1	.	238	. 9/29/64 .	108	. 11 . JNG . F
MULK (SEE ADDK)	.	.	.	.	.
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\* MULK TO NXALRM \*  
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PROGRAM STATISTICS

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\* MULK TO NXALRM \*  
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MULK - II .	.	76	.	9/29/64	.	78	.	5	.	SMS	.	F
• SETUP .	.	.	.	.	.	.	.	.	.	.	.	.
• ARG .	.	.	.	.	.	.	.	.	.	.	.	.
• STORE .	.	.	.	.	.	.	.	.	.	.	.	.
• RETURN .	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.
MULKS (SEE ADDK)	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.
MULLER .	.	757	.	9/ 9/64	.	232	.	36	.	IH	.	F
• SQRT .	.	.	.	.	.	.	.	.	.	.	.	.
MULPLY .	.	34	.	9/29/64	.	114	.	3	.	SMS	.	M
XMLPLY .	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.
MUVADD .	.	129	.	9/29/64	.	245	.	8	.	SMS	.	M
MVBLOK .	.	19	.	9/29/64	.	83	.	2	.	SMS	.	M
MVINV .	.	221	.	9/29/64	.	116	.	12	.	SMS	.	F
MVNSUM .	.	71	.	9/ 4/64	.	202	.	5	.	SMS	.	M
MVNTIN .	.	88	.	9/ 4/64	.	234	.	6	.	SMS	.	M
MVNTNA .	.	.	.	.	.	.	.	.	.	.	.	.
MVNTNA (SEE MVNTIN) .	.	.	.	.	.	.	.	.	.	.	.	.
MVSQAV .	.	236	.	9/29/64	.	116	.	13	.	SMS	.	F
M^RARE .	.	302	.	9/29/64	.	250	.	16	.	SMS	.	F
• EXP(2 .	.	.	.	.	.	.	.	.	.	.	.	.
NEXCOS (SEE SEQSAC) .	.	.	.	.	.	.	.	.	.	.	.	.
NEXSIN (SEE SEQSAC) .	.	.	.	.	.	.	.	.	.	.	.	.
NMZMG1 .	.	34	.	9/29/64	.	97	.	3	.	RAW	.	M
NOINT1 .	.	369	.	9/29/64	.	375	.	20	.	SMS	.	M
NOINT2 LINTR1 .	.	.	.	.	.	.	.	.	.	JNG	.	.
NOINT2 (SEE NOINT1) .	.	.	.	.	.	.	.	.	.	.	.	.
NRMVEC .	.	11	.	9/29/64	.	100	.	7	.	RAW	.	F
• SQRT .	.	.	.	.	.	.	.	.	.	.	.	.
• MAXAB .	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.
NTHA .	.	11	.	10/ 6/64	.	93	.	2	.	SMS	.	M
XNTHA .	.	.	.	.	.	.	.	.	.	.	.	.
NURINC .	.	121	.	9/ 4/64	.	327	.	8	.	SMS	.	M
NXALRM .	.	243	.	9/29/64	.	178	.	13	.	SMS	.	F
• FASCN1 .	.	.	.	.	.	.	.	.	.	.	.	.
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\* ONLINE TO PLOTVS \*  
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PROGRAM STATISTICS

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\* ONLINE TO PLOTVS \*  
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ONLINE	.	134	4/14/65	191	8	RAW	M
(STH)	.	(IOH)	.	.	.	.	.
(STHM)	.	(WER)	.	.	.	.	.
(STHD)	.	(TES)	.	.	.	.	.
.	(WRS)	.	.	.	.	.	.
.	(WTC)	.	.	.	.	.	.
.	(RCH)	.	.	.	.	.	.
.	(FIL)	.	.	.	.	.	.
.	(SPH)	.	.	.	.	.	.
.	.	.	.	.	.	.	.
OUDATA	.	495	3/15/65	269	11	JFC	F
.	VARARG	.	.	.	.	.	.
.	LOC	.	.	.	.	.	.
.	MVBLOK	.	.	.	.	.	.
.	FAPSUM	.	.	.	.	.	.
.	PAKN	.	.	.	.	.	.
.	(STB)	.	.	.	.	.	.
.	(WLR)	.	.	.	.	.	.
.	(EFT)	.	.	.	.	.	.
.	.	.	.	.	.	.	.
PACDAT	.	152	9/ 9/64	259	9	RAW	M
.	(IOS)	.	.	.	.	.	.
.	(TCO)	.	.	.	.	.	.
.	(RDS)	.	.	.	.	.	.
.	(RCH)	.	.	.	.	.	.
.	(ETT)	.	.	.	.	.	.
.	.	.	.	.	.	.	.
PAKN	.	78	9/29/64	147	5	JFC	M
.	FXDATA	.	.	.	.	.	.
.	.	.	.	.	.	.	.
PLANSF	.	1169	9/ 9/64	383	56	RAW	F
.	SETKS	.	.	.	.	.	.
.	LIMITS	.	.	.	.	.	.
.	IXCARG	.	.	.	.	.	.
.	CHOOSE	.	.	.	.	.	.
.	XOOZE	.	.	.	.	.	.
.	MOVREV	.	.	.	.	.	.
.	STZ	.	.	.	.	.	.
.	ROAR2	.	.	.	.	.	.
.	XADDKS	.	.	.	.	.	.
.	KOLAPS	.	.	.	.	.	.
.	COSTBL	.	.	.	.	.	.
.	SINTBL	.	.	.	.	.	.
.	XADDK	.	.	.	.	.	.
.	COSISI	.	.	.	.	.	.
.	MATRA	.	.	.	.	.	.
.	.	.	.	.	.	.	.
PLOTVS	.	494	9/ 4/64	261	18	SMS	F
.	SETVEC	.	.	.	.	.	.
.	SETKS	.	.	.	.	.	.
.	SETKV	.	.	.	.	.	.
.	(STH)	.	.	.	.	.	.
.	(FIL)	.	.	.	.	.	.
.	SWITCH	.	.	.	.	.	.
.	(SPH)	.	.	.	.	.	.
.	RND	.	.	.	.	.	.

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• PLTVS1 TO PROCOR •  
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## PROGRAM STATISTICS

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• PLTVS1 TO PROCOR •  
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PLTVS1	.	817	9/ 4/64	393	40	SMS	F
.	VARARG	.	.	.	.	.	.
.	SETKS	.	.	.	.	.	.
.	SETVEC	.	.	.	.	.	.
.	SETKVS	.	.	.	.	.	.
.	XSTLIN	.	.	.	.	.	.
.	XLOC	.	.	.	.	.	.
.	XSAME	.	.	.	.	.	.
.	RMSDEV	.	.	.	.	.	.
.	(STH)	.	.	.	.	.	.
.	(FIL)	.	.	.	.	.	.
.	MAXSN	.	.	.	.	.	.
.	MINSN	.	.	.	.	.	.
.	MULPLY	.	.	.	.	.	.
.	BOOST	.	.	.	.	.	.
.	PLOTVS	.	.	.	.	.	.
.	OPRESS	.	.	.	.	.	.
.	.	.	.	.	.	.	.
PLURAL (SEE SEVRAL)	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
PLURNS	.	73	9/29/64	247	5	SMS	M
.	.	.	.	.	.	.	.
PLYSYN	.	172	10/ 5/64	162	10	EAR	F
.	COS	.	.	.	.	.	.
.	CONVLV	.	.	.	.	.	.
.	.	219	9/29/64	134	11	SMS	F
.	FRQCT1	.	.	.	.	.	.
.	.	.	.	.	.	.	.
POLYDV	.	130	9/ 9/64	102	7	JFC	F
.	MOVE	.	.	.	.	RAW	.
.	STZ	.	.	.	.	.	.
.	.	.	.	.	.	.	.
POLYEV	.	54	9/29/64	62	4	JFC	F
.	.	.	.	.	.	.	.
POLYSN	.	256	9/ 8/64	167	14	RAW	F
.	SQRT	.	.	.	.	.	.
.	COS	.	.	.	.	.	.
.	CONVLV	.	.	.	.	.	.
.	MOVE	.	.	.	.	.	.
.	.	.	.	.	.	.	.
POWER	.	50	9/29/64	130	4	SMS	M
SMPRDV	EXP12	.	.	.	.	.	.
.	.	.	.	.	.	.	.
PRBFIT	.	373	9/29/64	187	16	RJG	F
.	SQRT	.	.	.	.	.	.
.	EXP12	.	.	.	.	.	.
.	FXP	.	.	.	.	.	.
.	.	.	.	.	.	.	.
PROB2	.	229	10/ 6/64	175	12	JNG	F
.	.	.	.	.	.	.	.
PROCOR	.	770	9/29/64	1499	40	SMS	M
FASCUR	.	.	.	.	.	.	.
FASEPC	.	.	.	.	.	.	.

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\* PRCOR TO QXCOR1 \*  
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## PROGRAM STATISTICS

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\* PROCOR TO QXCOP1 \*  
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FASCR1 .	.	.	.	.	.	.	.	.
FASEPI .	.	.	.	.	.	.	.	.
PSQRT .	.	155	10/ 5/64	91	9	JFC	.	F
SQRT .	.	.	.	.	.	.	.	.
PWMLIV .	.	300	9/29/64	142	15	SMS	.	F
MLI2A6 .	.	.	.	.	.	.	.	.
(STH) .	.	.	.	.	.	.	.	.
(FIL) .	.	.	.	.	.	.	.	.
(SPH) .	.	.	.	.	.	.	.	.
QACORR .	.	207	9/29/64	184	11	SMS	.	F
FXDATA .	.	.	.	.	.	.	.	.
PROCCR .	.	.	.	.	.	.	.	.
FASCOR .	.	.	.	.	.	.	.	.
FLDATA .	.	.	.	.	.	.	.	.
QCNVLV .	.	569	9/29/64	294	27	SMS	.	F
XLOC .	.	.	.	.	.	.	.	.
FXDATA .	.	.	.	.	"	.	.	.
PROCOR .	.	.	.	.	.	.	.	.
FASCOR .	.	.	.	.	.	.	.	.
FASEPC .	.	.	.	.	.	.	.	.
FLDATA .	.	.	.	.	.	.	.	.
QFURRY .	.	244	9/29/64	181	13	SMS	.	F
STZ .	.	.	.	.	.	.	.	.
MOVE .	.	.	.	.	.	.	.	.
COSTBL .	.	.	.	.	.	.	.	.
SINTBL .	.	.	.	.	.	.	.	.
XSPECT .	.	.	.	.	.	.	.	.
QIFURY .	.	280	9/29/64	206	14	SMS	.	F
COSTBL .	.	.	.	.	.	.	.	.
SENTBL .	.	.	.	.	.	.	.	.
COSISP .	.	.	.	.	.	.	.	.
XLOC .	.	.	.	.	.	.	.	.
QINTR1 .	.	229	9/ 4/64	192	12	JTP	.	F
RNDUP .	.	.	.	.	.	.	.	.
QUFIT1 .	.	.	.	.	.	.	.	.
QUFIT1 .	.	79	9/ 4/64	200	5	SMS	.	M
QXCORR .	.	283	9/29/64	249	15	SMS	.	F
XLOC .	.	.	.	.	.	.	.	.
FXDATA .	.	.	.	.	.	.	.	.
PROCOR .	.	.	.	.	.	.	.	.
FASCOR .	.	.	.	.	.	.	.	.
FLDATA .	.	.	.	.	.	.	.	.
QXCOR1 .	.	502	3/15/65	198	25	RAW	.	F
SETKS .	.	.	.	.	.	.	.	.
IXCARG .	.	.	.	.	.	.	.	.

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\* QXCOR1 TO RLSPR2 \*  
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PROGRAM STATISTICS

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\* QXCOR1 TO RLSPR2 \*  
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• LIMITS •	.	.	.	.	.	.	.
• STZ •	.	.	.	.	.	.	.
• REVERS •	.	.	.	.	.	.	.
• PROCOR •	.	.	.	.	.	.	.
• FASCR1 •	.	.	.	.	.	.	.
• FASEP1 •	.	.	.	.	.	.	.
• RDATA •	.	645	3/15/65	396	31	RAW	F
• SETUP •	.	.	.	.	.	.	.
• RETURN •	.	.	.	.	.	.	.
• IXCARG •	.	.	.	.	.	.	.
• (TSH) •	.	.	.	.	.	.	.
• (RTN) •	.	.	.	.	.	.	.
• (STH) •	.	.	.	.	.	.	.
• (FIL) •	.	.	.	.	.	.	.
• HVTOIV •	.	.	.	.	.	.	.
• IVTOHV •	.	.	.	.	.	.	.
• CMPRA •	.	.	.	.	.	.	.
• ARG •	.	.	.	.	.	.	.
• INTHOL •	.	.	.	.	.	.	.
• STORE •	.	.	.	.	.	.	.
• REFIT (SEE SPLIT) •	.	.	.	.	.	.	.
• REFLEC XRFLEC •	.	28	9/29/64	108	3	SMS	M
• REIM (SEE AMPHZ) •	.	.	.	.	.	.	.
• REMAV •	.	36	9/29/64	106	3	SMS	M
• REREAD •	.	114	9/ 9/64	283	7	RAW	M
• EOFSET •	(IOH)	.	.	.	.	.	.
• ENDFIL •	(RDS)	.	.	.	.	.	.
• (TSH) •	(ROD)	.	.	.	.	.	.
• (TSHM) •	(RCH)	.	.	.	.	.	.
• (TCO) •	.	.	.	.	.	.	.
• (TEF) •	.	.	.	.	.	.	.
• EXIT •	.	.	.	.	.	.	.
• (RER) •	.	.	.	.	.	.	.
• RETURN (SEE LOCATE) •	.	.	.	.	.	.	.
• LTR'ER •	.	30	9/29/64	98	3	SMS	M
• REVERS •	.	29	9/29/64	77	3	RAW	M
• RLSPR •	.	142	10/ 5/64	121	8	RAW	F
• FDOTR •	.	.	.	.	.	.	.
• RLSPR2 •	.	700	9/ 9/64	281	34	RAW	F
• IXCARG •	.	.	.	.	.	.	.
• STZ •	.	.	.	.	.	.	.
• MOVREV •	.	.	.	.	.	.	.
• DOTP •	.	.	.	.	.	.	.

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• RLSPR2 TO SEARCH •  
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## PROGRAM STATISTICS

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• RLSPR2 TO SEARCH •  
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• MATML3 •	.	.	.	.	.	.	.	.
• DOTJ •	.	.	.	.	.	.	.	.
• SIMEQ •	.	.	.	.	.	.	.	.
•	.	.	.	.	.	.	.	.
RLSSR	.	82	9/29/64	.	115	.	5	RAW F
• FOOTR •	.	.	.	.	.	.	.	.
•	.	.	.	.	.	.	.	.
RMSDAV (SEE RMSDEV)	.	.	.	.	.	.	.	.
•	.	.	.	.	.	.	.	.
RMSDEV	.	50	9/ 4/64	.	160	.	4	SMS M
RMSDAV	.	SQRT	.	.	.	.	.	.
•	.	.	.	.	.	.	.	.
RND	.	15	9/29/64	.	79	.	2	RAW M
RNDUP	.	.	.	.	.	.	.	.
RNDDN	.	.	.	.	.	.	.	.
•	.	.	.	.	.	.	.	.
RNDDN (SEE RND)	.	.	.	.	.	.	.	.
•	.	.	.	.	.	.	.	.
RNDUP (SEE RND)	.	.	.	.	.	.	.	.
•	.	.	.	.	.	.	.	.
RNDV	.	34	9/29/64	.	118	.	3	SMS M
RNDVUP	.	RND	.	.	.	.	.	.
RNDVDN	.	RNDUP	.	.	.	.	.	.
•	RNDDN	.	.	.	.	.	.	.
•	RNDVDN (SEE RNDV)	.	.	.	.	.	.	.
•	RNDVUP (SEE RNDV)	.	.	.	.	.	.	.
•	.	.	.	.	.	.	.	.
ROAR2	.	174	9/10/64	.	114	.	9	RAW F
• MATRA •	.	.	.	.	.	.	.	.
• MOVREV •	.	.	.	.	.	.	.	.
• REVERS •	.	.	.	.	.	.	.	.
•	.	.	.	.	.	.	.	.
ROTAT1	.	46	9/ 4/64	.	110	.	4	RAW+ M
•	.	.	.	.	.	.	JC	.
•	RPLFMT	.	17	9/29/64	.	85	.	2 SMS M
•	.	.	.	.	.	.	.	.
RSKIP	.	37	9/29/64	.	90	.	3	RAW M
• (IOS) •	.	.	.	.	.	.	.	.
• (TRC) •	.	.	.	.	.	.	.	.
• (TCO) •	.	.	.	.	.	.	.	.
• (TEF) •	.	.	.	.	.	.	.	.
• (RDSI) •	.	.	.	.	.	.	.	.
• (BSR) •	.	.	.	.	.	.	.	.
•	.	.	.	.	.	.	.	.
RVPRTS (SEE CHPRTS)	.	.	.	.	.	.	.	.
•	.	.	.	.	.	.	.	.
SAME	.	1	9/29/64	.	40	.	2	JFC M
XSAME	.	.	.	.	.	.	.	.
•	.	.	.	.	.	.	.	.
SCPSCL	.	33	9/29/64	.	111	.	3	SMS M
SEARCH	.	25	9/29/64	.	95	.	3	RAW M
•	.	.	.	.	.	.	.	.

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\* SECSAC TO SETVEC \*  
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## PROGRAM STATISTICS

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\* SEQSAC TO SETVEC \*  
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SEQSAC	.	94	9/ 8/64	278	6	SMS	M
NEXCOS	COS	.	.	.	.	.	.
NEXSIN	SIN	.	.	.	.	.	.
SETAPT (SEE INDEX)	.	.	.	.	.	.	.
SETEST (SEE INDEX)	.	.	.	.	.	.	.
SETINO	.	84	9/ 8/64	92	6	SMS	F
.	XLIMIT	.	.	.	.	.	.
.	(RWT)	.	.	.	.	.	.
.	(TSB)	.	.	.	.	.	.
.	(RLR)	.	.	.	.	.	.
.	FSKIP	.	.	.	.	.	.
SETK	.	37	9/29/64	190	3	SMS	M
SETKS	.	.	.	.	.	.	.
SETVEC	.	.	.	.	.	.	.
SETK - II	.	63	9/29/64	73	4	SMS	F
.	SETUP	.	.	.	.	.	.
.	STORE	.	.	.	.	.	.
.	RETURN	.	.	.	.	.	.
SETKP	.	40	9/29/64	124	3	SMS	M
SETVCP	SETK	.	.	.	.	.	.
.	SETVEC	.	.	.	.	.	.
SETKS (SEE SETK)	.	.	.	.	.	.	.
SETKS - II	.	91	9/29/64	86	6	SMS	F
.	SETUP	.	.	.	.	.	.
.	ARG	.	.	.	.	.	.
.	STORE	.	.	.	.	.	.
.	RETURNN	.	.	.	.	.	.
SETKV	.	15	9/29/64	75	2	SMS	M
SETKVS	.	25	9/29/64	106	3	SMS	M
SETLIN	.	27	9/29/64	95	3	SMS	M
XSTLIN	.	.	.	.	.	.	.
SETLNS	.	39	9/29/64	124	3	SMS	M
.	SETLIN	.	.	.	.	.	.
.	XSTLIN	.	.	.	.	.	.
SETSBV (SEE LOCATE)	.	.	.	.	.	.	.
SETUP (SEE LOCATE)	.	.	.	.	.	.	.
SETVCP (SEE SETKP)	.	.	.	.	.	.	.
SETVEC (SEE SETK)	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.

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• SEVRAL TO SQROOT •  
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## PROGRAM STATISTICS

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• SEVRAL TO SQROOT •  
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SEVRAL .	.	416 .	9/29/64 .	949 .	22 .	SMS . M
PLURAL .	LOCATE .	.	.	.	.	.
''DO'' .	WHERE .	.	.	.	.	.
''IF'' .	.	.	.	.	.	.
SHFTR1 .	.	70 .	9/29/64 .	158 .	5 .	SMS . M
SHFTR2 .	.	72 .	9/29/64 .	163 .	5 .	SMS+ . M
.	.	.	.	.	.	RAW .
SHUFFL .	.	101 .	9/ 8/64 .	125 .	6 .	SMS . F
.	GETRD1 .	.	.	.	.	.
.	SEARCH .	.	.	.	.	.
.	SIZEUP .	.	.	.	.	.
SIFT .	.	30 .	9/ 4/64 .	118 .	3 .	SMS . M
SIMEQ .	.	441 .	9/ 9/64 .	642 .	24 .	JTO+ . M
DETRM .	.	.	.	.	.	AMN+ .
.	.	.	.	.	.	RAW .
SINTBL (SEE COSTBL) .	.	.	.	.	.	.
SINTBX (SEE COSTBL) .	.	.	.	.	.	.
SISP (SEE COSP) .	.	.	.	.	.	.
SIZEUP .	.	136 .	3/15/65 .	247 .	8 .	RAW+ . M
SIZUPL .	.	.	.	.	.	SMS .
SIZUPL (SEE SIZEUP) .	.	.	.	.	.	.
SMPRDV (SEE POWER) .	.	.	.	.	.	.
SMPSON .	.	317 .	9/ 4/64 .	197 .	17 .	JNG . F
SPCOR2 .	.	291 .	9/ 8/64 .	181 .	15 .	RAW . F
.	XLOC .	.	.	.	.	.
.	STZ .	.	.	.	.	.
.	FXDATA .	.	.	.	.	.
.	QXCOR1 .	.	.	.	.	.
.	FLDATA .	.	.	.	.	.
SPLIT .	.	224 .	9/29/64 .	395 .	13 .	SMS . M
REFIT .	.	.	.	.	.	.
SQRDEV (SEE SQRDFR) .	.	.	.	.	.	.
SQRDFR .	.	36 .	9/29/64 .	111 .	3 .	SMS . M
SQRDEV .	.	.	.	.	.	.
SQRMLI .	.	55 .	9/29/64 .	128 .	4 .	SMS . M
SQROOT .	.	24 .	9/29/64 .	83 .	3 .	SMS . M
.	SQRT .	.	.	.	.	.
.	.	.	.	.	.	.

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\* SQRSUM TO TINGL \*  
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PROGRAM STATISTICS

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\* SQRSUM TO TINGL \*  
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SQRSUM .	.	36 .	9/29/64 .	107 .	3 .	SMS . M
XSQSUM .	.	.	.	.	.	.
SQUARE .	.	32 .	9/29/64 .	111 .	3 .	SMS . M
XSQUAR .	.	.	.	.	.	.
SRCH1 .	.	93 .	9/ 8/64 .	93 .	6 .	RAW . F
. XACTEQ .	.	.	.	.	.	.
STEPC (SEE DELTA) .	.	.	.	.	.	.
STEPL (SEE DELTA) .	.	.	.	.	.	.
STEPR (SEE DELTA) .	.	.	.	.	.	.
(STH) (SEE ONLINE) .	.	.	.	.	.	.
(STHD) (SEE ONLINE) .	.	.	.	.	.	.
(STHM) (SEE ONLINE) .	.	.	.	.	.	.
STORE (SEE LOCATE) .	.	.	.	.	.	.
STZ .	.	14 .	9/29/64 .	60 .	2 .	JFC . M
STZS .	.	24 .	9/29/64 .	97 .	3 .	SMS . M
SUBK (SEE ADDK) .	.	.	.	.	.	.
SUBKS (SEE ADDK) .	.	.	.	.	.	.
SUM .	.	23 .	9/29/64 .	92 .	3 .	SMS . M
XSUM .	.	.	.	.	.	.
SUMDEV (SEE SUMDFR) .	.	.	.	.	.	.
SUMDFR .	.	44 .	9/29/64 .	156 .	4 .	SMS . M
XSMDFR .	.	.	.	.	.	.
SUMDEV .	.	.	.	.	.	.
XSMDEV .	.	.	.	.	.	.
SWITCH .	.	15 .	9/ 4/64 .	84 .	2 .	SMS . M
TAMVL .	.	63 .	9/ 4/64 .	189 .	5 .	SMS . M
TAMVR .	.	.	.	.	.	.
TAMVR (SEE TAMVL) .	.	.	.	.	.	.
TIMA2B .	.	124 .	9/ 9/64 .	258 .	8 .	SMS+ . M
.	.	.	.	.	.	RAW .
TIMSUB .	.	229 .	9/ 8/64 .	450 .	13 .	SMS+ . M
INTMSB . TIMA2B .	.	.	.	.	.	RAW .
TINGL .	.	43 .	9/ 8/64 .	147 .	4 .	SMS . M
TINGLA .	.	.	.	.	.	.

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• TINGLA TO WAC •  
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## PROGRAM STATISTICS

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• TINGLA TO WAC •  
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TINGLA (SEE TINGL)	.	.	.	.	.	.	.	.	
TRMINO	.	67	9/ 4/64	77	5	SMS	.	F	
.	XLIMIT	.	.	.	.	.	.	.	
.	OUDATA	.	.	.	.	.	.	.	
.	FSKIP	.	.	.	.	.	.	.	
.	(RWT)	.	.	.	.	.	.	.	
.	.	.	.	.	.	.	.	.	
(TSH) (SEE REREAD)	.	.	.	.	.	.	.	.	
.	(TSHM) (SEE REREAD)	.	.	.	.	.	.	.	
UNPAKN	.	78	9/ 9/64	150	5	JFC	.	M	
.	VARARG	.	44	9/29/64	132	4	JFC	.	M
.	VDDTV	.	25	9/ 4/64	121	3	SMS	.	M
.	VDVBYV	.	22	9/29/64	90	3	SMS	.	M
VECOUT	.	66	9/29/64	91	5	SMS	.	F	
.	FMDFMT	.	.	.	.	.	.	.	
.	RPLFMT	.	.	.	.	.	.	.	
.	(STH)	.	.	.	.	.	.	.	
.	(FIL)	.	.	.	.	.	.	.	
.	.	.	.	.	.	.	.	.	
VINDEX (SEE INDEX)	.	.	.	.	.	.	.	.	
.	VMNUSV (SEE VPLUSV)	.	.	.	.	.	.	.	
VOUT	.	104	9/29/64	111	7	SMS	.	F	
.	CARIGE	.	.	.	.	.	.	.	
.	HRACJ	.	.	.	.	.	.	.	
.	(STH)	.	.	.	.	.	.	.	
.	(FIL)	.	.	.	.	.	.	.	
.	VECOUT	.	.	.	.	.	.	.	
.	.	.	.	.	.	.	.	.	
VPLUSV	.	34	9/29/64	127	3	SMS	.	M	
.	XVPLSV	.	.	.	.	.	.	.	
.	VMNUSV	.	.	.	.	.	.	.	
.	XVMNSV	.	.	.	.	.	.	.	
.	.	.	.	.	.	.	.	.	
VRSOUT	.	47	9/29/64	138	4	SMS	.	M	
.	CARIGE	.	.	.	.	.	.	.	
.	VECOUT	.	.	.	.	.	.	.	
.	.	.	.	.	.	.	.	.	
VSOUT	.	37	9/29/64	125	3	SMS	.	M	
.	VOUT	.	.	.	.	.	.	.	
.	.	.	.	.	.	.	.	.	
VTIMSV	.	34	9/29/64	112	3	SMS	.	M	
.	XVTMSV	.	.	.	.	.	.	.	
.	.	.	.	.	.	.	.	.	
WAC	.	107	9/29/64	83	6	JFC	.	F	
.	.	.	.	.	.	.	.	.	

\*\*\*\*\*  
\* WHERE TO XDPRSS \*  
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PROGRAM STATISTICS

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\* WHERE TO XDPRSS \*  
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WHERE (SEE LOCATE).	.	.	.	.	.	.	.
WHICH	.	.	4	9/ 4/64	.	77	.
XWHICH	.	.	.	.	.	2	SMS . M
WLLSFP	.	217	.	10/ 6/64	.	264	.
• FOOTR	.	.	.	.	.	.	.
• FOOT	.	.	.	.	.	.	.
• MOVE	.	.	.	.	.	.	.
WRTDAT	.	77	.	9/ 8/64	.	126	.
• (IOS)	.	.	.	.	.	.	.
• (TCI)	.	.	.	.	.	.	.
• (WRS)	.	.	.	.	.	.	.
• (RCH)	.	.	.	.	.	.	.
• (TRC)	.	.	.	.	.	.	.
• (ETT)	.	.	.	.	.	.	.
XACTEQ	.	11	.	9/ 4/64	.	76	.
XADDK (SEE ADDK)	.	.	.	.	.	.	.
XADDKS (SEE ADDK)	.	.	.	.	.	.	.
XARG (SEE LOCATE).	.	.	.	.	.	.	.
XAVRGE	.	34	.	9/29/64	.	104	.
XAVRGR	.	XDIV	.	.	.	.	.
.	XDIVR	.	.	.	.	.	.
XAVRGR (SEE XAVRGE)	.	.	.	.	.	.	.
XBOOST (SEE BOOST)	.	.	.	.	.	.	.
XCMPRA (SEE CMPRA)	.	.	.	.	.	.	.
XDANL (SEE ADANL)	.	.	.	.	.	.	.
XDANX (SEE ADANL)	.	.	.	.	.	.	.
XDELTA (SEE DELTA)	.	.	.	.	.	.	.
XDFPRS (SEE DIFPRS)	.	.	.	.	.	.	.
XDIV	.	27	.	9/29/64	.	109	.
XDIVR	.	.	.	.	.	.	.
XDIVK (SEE ADDK)	.	.	.	.	.	.	.
XDIVKS (SEE ADDK)	.	.	.	.	.	.	.
XDIVR (SEE XDIV)	.	.	.	.	.	.	.
XDPRSS (SEE BOOST)	.	.	.	.	.	.	.
•	.	.	.	.	.	.	.

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\* XDVIDE TO XSPECT \*  
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PROGRAM STATISTICS

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\* XDVIDE TO XSPECT \*  
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XDVIDE	.	33	.	9/29/64	.	105	.	3	.	SMS	.	M
XDVIDR	.	XDIV	.	.	.	.	.	.	.	.	.	.
.	XDIVR	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.
XDVIDR (SEE XDVIDE)	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.
XCVRK (SEE ADDK)	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.
XDVRKS (SEE ADDK)	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.
XFIXM	.	.	31	.	9/29/64	.	98	.	3	.	SMS	.
.	.	.	.	.	.	.	.	.	.	.	.	.
XINDEX (SEE LOCATE)	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.
XLCOMM	.	.	14	.	9/4/64	.	76	.	2	.	RAW	.
.	.	.	.	.	.	.	.	.	.	.	.	.
XLIMIT	.	.	25	.	9/4/64	.	101	.	3	.	SMS	.
.	.	.	.	.	.	.	.	.	.	.	.	.
XLOCV	.	.	24	.	9/4/64	.	100	.	3	.	SMS	.
.	.	.	.	.	.	.	.	.	.	.	.	.
XLSHFT (SEE LSHFT)	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.
XMLPLY (SEE MULPLY)	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.
XMULK (SEE ADDK)	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.
XMULKS (SEE ADDK)	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.
XNAME (SEE LOCATE)	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.
XNARGS (SEE LOCATE)	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.
XNTHA (SEE NTHA)	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.
XNTSUM (SEE INTSUM)	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.
XOOZE	.	.	4	.	9/4/64	.	61	.	2	.	SMS	.
.	.	.	.	.	.	.	.	.	.	.	.	.
XREMAV	.	.	31	.	9/29/64	.	112	.	3	.	SMS	.
.	XAVRGR	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.
XRFLEC (SEE REFLEC)	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.
XSAME (SEE SAME)	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.
XSMDEV (SEE SUMDFR)	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.
XSMDFR (SEE SUMDFR)	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.
XSPECT	.	.	523	.	9/29/64	.	239	.	26	.	SMS	.
.	SPLIT	.	.	.	.	.	.	.	.	.	.	.
.	COSISP	.	.	.	.	.	.	.	.	.	.	.
.	REFIT	.	.	.	.	.	.	.	.	.	.	.
.	XLOC	.	.	.	.	.	.	.	.	.	.	.
.	KOLAPS	.	.	.	.	.	.	.	.	.	.	.
.	CHPR1S	.	.	.	.	.	.	.	.	.	.	.

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\* XSCDEV TO ZEFBIN \*  
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## PROGRAM STATISTICS

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\* XSQDEV TO ZEFBIN \*  
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XSQDEV (SEE XSQDFR)	.	.	.	.	.	.	.	.
XSQDFR	.	37	9/29/64	113	3	SMS	M	XSQDEV
XSQRUT	.	37	9/29/64	103	3	SMS	M	FIXVR
	.	.	.	.	.	.	.	SQRT
XSQSUM (SEE SQRSUM)	.	.	.	.	.	.	.	.
XSQUAR (SEE SQUARE)	.	.	.	.	.	.	.	.
XSTEPC (SEE DELTA)	.	.	.	.	.	.	.	.
XSTEPL (SEE DELTA)	.	.	.	.	.	.	.	.
XSTEPR (SEE DELTA)	.	.	.	.	.	.	.	.
XSTLIN (SEE SETLIN)	.	.	.	.	.	.	.	.
XSUBK (SEE ADDK)	.	.	.	.	.	.	.	.
XSUBKS (SEE ADDY)	.	.	.	.	.	.	.	.
XSUM (SEE SUM)	.	.	.	.	.	.	.	.
XVDRBV (SEE XDVBV)	.	.	.	.	.	.	.	.
XDVBV	.	34	9/29/64	109	3	SMS	M	XVDRBV
	.	XDIV	.	.	.	.	.	XDIVR
XVMNSV (SEE VPLUSV)	.	.	.	.	.	.	.	.
XVPLSV (SEE VPLUSV)	.	.	.	.	.	.	.	.
XVTMSV (SEE VTIMSV)	.	.	.	.	.	.	.	.
XWHICH (SEE WHICH)	.	.	.	.	.	.	.	.
ZEFBCD	.	54	9/ 8/64	129	4	JNG	M	ZEFBIN (IOS)
	.	(RDS)	.	.	.	.	.	(RCH)
	.	(TCI)	.	.	.	.	.	(TEF)
	.	(TPC)	.	.	.	.	.	(BSR)
ZEFBIN (SEE ZEFBCD)	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.

#### 4. Conventions Used in Program Writeups

The general format of preparation of symbolic decks we have adhered to is illustrated by the sample listings shown on the next few pages for the two very short routines CONV1V and RND (File 28 of Tape 1 and File 79 of Tape 2). In all cases the general sequence is 1) Control Cards, 2) Subroutine or Entry cards, 3) Comment cards giving Abstract (including language, equipment, length, speed, and author), 4) Comment cards giving Usage (including FORTRAN usage, transfer vector, input-output descriptions, and examples), and 5) Program proper. All cards are serialized after the first one, in columns 76-79. The following observations should assist the interpretation of our comment cards.

1. All programs are designed to operate under the FORTRAN-II system.
2. In general we adhere to FORTRAN conventions in naming fixed, floating point, octal, and hollerith variables regardless of whether the program is FAP or FORTRAN. This convention should always be assumed for subroutine arguments unless otherwise noted.
3. The term "FORTRAN INTEGER" or FORTRAN-II INTEGER" or sometimes just "INTEGER" is used to refer to a fixed point integer in the decrement (binary point between bits 17 and 18,

Sample program listings

\* CONVLV (SUBROUTINE) 9/29/64 LAST CARD IN DECK IS NO. 0098  
\* LABEL 0001  
C CONVLV 0002  
SUBROUTINE CONVLV(LX,XX,LY,YY,CC) 0003  
C 0004  
C -----ABSTRACT---- 0005  
C 0006  
C TITLE - CONVLV 0007  
C COMPLETE CONVOLUTION OF TWO TRANSIENTS 0008  
C 0009  
C CONVLV CONVOLVES TWO TRANSIENTS, X(I) I=0,1,...,LX-1 0010  
C AND Y(I) I=0,1,...,LY-1 , TO PRODUCE THE COMPLETE 0011  
C CONVOLUTION FUNCTION 0012  
C 0013  
C C(I) = SUM ( X(J)\*Y(I-J) ) 0014  
C J=0 0015  
C 0016  
C FOR I = 0,1,...,LX+LY-2 0017  
C WHERE 0018  
C LX AND LY ARE INPUT PARAMETERS 0019  
C Y(K) IS ASSUMED = 0.0 FOR K OUTSIDE OF 0020  
C THE RANGE 0 TO LY-1 0021  
C NOTE THAT THE CONVOLUTION IS INDEPENDENT OF THE ORDER 0022  
C OF THE INPUTS X AND Y. 0023  
C 0024  
C TECHNIQUE USED IS AN ALGORITHM BASED ON ANALOGY TO 0025  
C MULTIPLICATION OF POLYNOMIALS 0026  
C 0027  
C LANGUAGE - FORTRAN II SUBROUTINE 0028  
C EQUIPMENT - 709 OR 7090 (MAIN FRAME ONLY) 0029  
C STORAGE - 96 REGISTERS 0030  
C SPEED - ABOUT .49 \* (LX\*LY) MILLISEC ON THE 709 0031  
C ABOUT .082 \* (LX\*LY) MILLISEC ON THE 7090 0032  
C AUTHOR - J. CLAERBOUT 0033  
C 0034  
C -----USAGE---- 0035  
C 0036  
C TRANSFER VECTOR CONTAINS ROUTINES - (NINE) 0037  
C AND FORTRAN SYSTEM ROUTINES - (NONE) 0038  
C 0039  
C FORTRAN USAGE 0040  
C CALL CONVLV(LX,XX,LY,YY,CC) 0041  
C 0042  
C INPUTS 0043  
C 0044  
C LX IS NO. OF TERMS IN X VECTOR 0045  
C MUST EXCEED ZERO (PROGRAM EXITS IF ZERO OR LESS) 0046  
C 0047  
C XX(I) I=1,...,LX CONTAINS X(0),...,X(LX-1) RESPECTIVELY 0048  
C 0049  
C 0050

Sample program listings

```
C LY      IS NO. OF TERMS IN Y VECTOR          0051
C           MUST EXCEED ZERO (PROGRAM EXITS IF ZERO OR LESS) 0052
C
C YY(I)   I=1...LY  CONTAINS Y(0),...,Y(LY-1) RESPECTIVELY 0053
C           EQUIVALENCE (XX,YY) IS PERMITTED 0054
C
C OUTPUTS 0055
C
C CC(I)   I=1,...,LX+LY-1 CONTAINS C(0),...,C(LX+LY-2) RESPECTIVELY 0056
C           WHERE C(I) IS GIVEN IN ABSTRACT 0057
C
C EXAMPLES 0058
C
C 1. SHOWING REVERSIBILITY OF X AND Y 0059
C INPUTS - LX = 3  XX(1...3) = 1.,2.,3. 0060
C           LY = 2  YY(1...2) = 10.,1. 0061
C
C USAGE - CALL CONVLV(LX,XX,LY,YY,CC1) 0062
C           CALL CONVLV(LY,YY,LX,XX,CC2) 0063
C CUTPUTS - CC1(1...4) = CC2(1...4) = 10.,21.,32.,3. 0064
C
C 2. ILLEGAL INPUT CASES (NO OUTPUT) 0065
C INPUTS - SAME AS EXAMPLE 1. EXCEPT START WITH OUTPUT VECTORS 0066
C           CLEANED, I.E. CC1(1...4) = CC2(1...4) = 0.,0.,0.,0. 0067
C LSAGE - CALL CONVLV(-2,XX,LY,YY,CC1) 0068
C           CALL CONVLV(LX,XX,0,YY,CC2) 0069
C CUTPUTS - CC1(1...4) = 0.,0.,0.,0. (ILLEGAL LX) 0070
C           CC2(1...4) = 0.,0.,0.,0. (ILLEGAL LY) 0071
C
C PROGRAM FOLLOWS BELOW 0072
C
C DYNAMIC DIMENSION STATEMENTS 0073
C DIMENSION XX(2),YY(2),CC(2) 0074
C
C CHECK LEGALITIES 0075
C IF (LX) 9999,9999,10 0076
C 10 IF (LY) 9999,9999,20 0077
C
C CLEAR OUTPUT VECTOR 0078
C 20 LC=LX+LY-1 0079
C DO 30 I=1,LC 0080
C 30 CC(I)=0.0 0081
C
C CONVOLVE 0082
C DO 40 I=1,LX 0083
C DO 40 J=1,LY 0084
C   K=I+J 0085
C 40 CC(K-1)=CC(K-1)+XX(I)*YY(J) 0086
C
C EXIT 0087
C 9999 RETURN 0088
C END 0089
```

Sample program listings

\* RND (FUNCTION) 9/29/64 LAST CARD IN DECK IS NO. 0078  
\* FAP 0001  
\* RND 0002  
\* COUNT 60 0003  
\* LBL RND 0004  
\* ENTRY RND F(Y) 0005  
\* ENTRY RNDUP F(Y) 0006  
\* ENTRY RNDDN F(Y) 0007  
\* 0008  
\* -----ABSTRACT----- 0009  
\* 0010  
\* TITLE - RND , WITH SECONDARY ENTRY POINTS RNDUP, RNDDN 0011  
\* ROUNDS FLTG. PT. NO. UP, DOWN, OR TO NEAREST FLTG. PT. INTEGER 0012  
\* 0013  
\* RND ROUNDS A FLOATING POINT NUMBER TO THE NEAREST FLOATING 0014  
\* POINT INTEGER. 0015  
\* 0016  
\* RNDUP ROUNDS A POSITIVE (NEGATIVE) FLOATING POINT NUMBER 0017  
\* TO THE NEXT HIGHER (LOWER) FLOATING POINT INTEGER. 0018  
\* 0019  
\* RNDDN ROUNDS A POSITIVE (NEGATIVE) FLOATING POINT NUMBER 0020  
\* TO THE NEXT LOWER (HIGHER) FLOATING POINT INTEGER. 0021  
\* 0022  
\* LANGUAGE - FAP, FORTRAN II FUNCTION 0023  
\* EQUIPMENT - 709 OR 7090 (MAIN FRAME ONLY) 0024  
\* STORAGE - 15 REGISTERS 0025  
\* SPEED - 26 MACHINE CYCLES FOR RND 0026  
\* AUTHOR - R.A. WIGGINS, 15/9/62 0027  
\* 0028  
\* -----USAGE----- 0029  
\* 0030  
\* TRANSFER VECTOR CONTAINS ROUTINES - NONE 0031  
\* AND FORTRAN SYSTEM ROUTINES - NONE 0032  
\* 0033  
\* FORTRAN USAGE 0034  
\* X1 = RNDF(Y) 0035  
\* X2 = RNDUPF(Y) 0036  
\* X3 = RNDDNF(Y) 0037  
\* 0038  
\* INPLTS 0039  
\* 0040  
\* Y IS A FLOATING POINT NUMBER 0041  
\* MUST BE LSTMN= 10.\*\*\*9 0042  
\* 0043  
\* OUTPUTS 0044  
\* 0045  
\* X1 IS A FLOATING POINT INTEGER 0046  
\* X2 IS A FLOATING POINT INTEGER 0047  
\* X3 IS A FLOATING POINT INTEGER 0048  
\* 0049  
\* 0050

Sample program listings

•	EXAMPLES	0051
•		0052
•	1. INPUT - Y=104.2	0053
•	CUTPUTS - X1=104. X2=105. X3=104.	0054
•		0055
•	2. INPUT - Y=.5	0056
•	CUTPUTS - X1=1. X2=1. X3=0.	0057
•		0058
•	3. INPUT - Y=-49.7	0059
•	CUTPUTS - X1=-50. X2=-50. X3=-49.	0060
•		0051
•	4. INPUT - Y=1015.	0' 62
•	CUTPUTS - X1=1015. X2=1015. X3=1015.	. 83
•		.064
	BCI 1,RND	0065
RNDUP TMI A		0066
FAD =01777777777777		0067
FAD =.5		0068
RNDDN UFA =02330000000000		0069
FAD =02330000000000		0070
TRA 1,4		0071
A FSB =01777777777777		0072
FSB =.5		0073
TRA RNDDN		0074
RND TMI A+1		0075
TRA RNDUP+2		0076
END		0077
		0078

maximum magnitude =  $2^{17}-1$ ).

4. The term "MACHINE LANGUAGE INTEGER" or "MACHINE INTEGER", or sometimes "MLI" is used to refer to fixed point integers in the address (binary point beyond bit 35, maximum magnitude =  $2^{35}-1$ ).
5. The terms "LSTHN" and "LSTHN=" are equivalent to "<" and " $\leq$ ". The terms "GRTHN" and "GRTHN=" are equivalent to ">" and " $\geq$ ".
6. The names of all our subprogram-type routines (subroutines, functions) are always the same as their entry point (in the case of multiple entry point routines the first entry point listed is equated with the name). A serial number "-II" or "-III" following the name indicates that this program is one of a series, all of which have identical calling sequences and essentially the same functions, but the user must choose the appropriate one in terms of his requirements. A "(709)" following the name indicates that this routine can only be used on the 709. A "(7090)" indicates the program works on either the 7090 or the 7094. All the routines without such specification can be used on any of the three machines.
7. Expressions appearing under "ABSTRACT" may deviate from FORTRAN conventions. The emphasis here has been to produce expressions which are visually

close to those of ordinary mathematics.

8. In the listings of required routines as found in the transfer vectors we list separately the FORTRAN system routines (which can be ignored) and non-FORTRAN-system routines (which cannot be ignored). All of the non-FORTRAN system routines required are included somewhere in the program set. In this connection the word "NONE" or "(NONE)" means "none required" and does not refer to routines by those names.
9. It should be stressed that the transfer vector as listed is only the first level of subprogram requirements and the subprograms listed should be checked for further subprogram requirements. The table in Section 3 is probably the most rapid and accurate for determining the complete requirements.
10. In the usage of these programs it should be assumed that none of the subprogram arguments can be safely equated (either by equivalence statements or repeated use of the same name) except as specifically noted.
11. The numerical examples given involve some notation conventions which should be fairly obvious.

Thus

- A) "IX(1...5) = 2,4,6,8,10" or  
"IX(1,2,...,5) = 2,4,6,8,10" stands for  
"IX(1) = 2", "IX(2) = 4," etc.

- B) "OCT" stands for octal data
- C) "MLI" is machine language integer

The representation of hollerith data is not too satisfactory or consistent as given here. In most cases we use either

$$\begin{aligned} X(1...) &= 6H(\text{something}) \\ &= 6H\text{something} \end{aligned}$$

to imply that the "something" is a string of hollerith characters stored 6 to a register (i.e. FORMAT(A6)). However, in some cases the "something" may be split into groups of six characters separated by commas to conform to a representation such as A) above. The reader will have to use his judgment from the context.

12. In the examples, if no "USAGE" is given, the user is to assume that, following the setting up of the "INPUTS", a "CALL" statement is to be executed in the exact literal form as given under "FORTRAN USAGE".
13. In the case of programs with scope output, blank comment cards are inserted at appropriate places in the example outputs so that photographs of the actual outputs can be pasted there on the listings.
14. Instructions equivalent to the linkage director have been inserted in many of the FAP programs so that they may operate properly with systems which do not have the standard error procedure. The pro-

grams will, of course, operate with systems which do have the standard error procedure option operative but the error tracing scheme will not be able to function completely since index register four will be stored in the "artificial linkage" director rather than in the one constructed by the assembler. In many cases the error procedure may be made completely operative by removing the PZE 0 and BCI 1, NAME cards appearing at the beginning of the program.

## 5. Magnetic Tape Copies

The following steps have been taken in the production of the master tape from which copies will be made.

1. All programs to be included had special test programs written which tested, among other things, all examples given in the program comment cards. These tests were passed individually.
2. The symbolic decks were divided into groups, each group being loaded on a separate tape.
3. Each such tape was then serialized and dated by a special program and then the serialized tapes were compiled to produce sets of binary decks.
4. The binary decks thus compiled were rerun through the test programs, and the test results compared with earlier test results.
5. The serialized tapes were merged by program to form the master tape.
6. The master tape was then compiled and the binaries from this compilation compared by the 519 reproducing punch against the binary decks used in step 4.

VELA UNIFORM associates desiring a copy of these programs should write their request to

Headquarters, USAF/AFTAC  
VELA Seismological Center  
Washington 25, D. C. 20330  
ATTN: Major J. J. Connor

The letter should request

"MIT Geophysics Program Set II".

By separate mail the requester should also send two  
2400' blank tapes.

## 6. KWIC Index to Programs

The remaining pages are a KWIC (Key Work in Context) index of the 267 programs in the program set (produced by the routine ROKWIC). Our coding in this index is as follows

Column      65      F means FORTRAN program

M means FAP program

66      Blank means FORTRAN-type subroutine  
              or functions

\* means main program

67-80      give the program name

## KWIC Index

SQUARES PREDICTOR BY RECURSION, 1-DIMENSION	SREALIZABLE LEAST	F	RLSPR
\$DISPLACED DOT PRODUCT OF 2-DIMENSIONAL ARRAYS		F	DOTP
ENTRO-SYMMETRIC OR ANTSYMMETRIC 2-DIMENSIONAL ARRAY	\$ROTATE C	F	ROAR2
\$SPATIAL CROSSCORRELATION OF 2-DIMENSIONAL SPATIAL ARRAYS		F	SPCOP2
SQUARES PREDICTOR BY RECURSION, 2-DIMENSIONS	SREALIZABLE LEAST	F	RLSPR2
SHIGH SPEED 24 POINT SPECTRUM		F	FT24 -II
SHIGH SPEED 24 POINT SPECTRUM		M	FT24
SFAST ABSOLUTE VALUE OF A VECTOR		M	ABSVL
\$MOVING TRAPEZOIDAL INTEGRAL OR ABSOLUTE VALUE INTEGRAL		M	MVNTIN
NGTH \$SUMMATION OF VECTOR OVER ABUTTING BLOCKS OF CONSTANT LENGTH		M	BLKSUM
MILLION RANDOM DIGITS FROM TAPE	SACCESS ROUTINE FOR RAND CORP.	F	GETRD1
FORMAT	SACCESS TO LITERAL OR ORDINARY	M	FNDFMT
TIME OF NEXT SUBROUTINE TO GIVEN ACCURACY	\$FIND OPERATION	M	TIMSUB
GE \$REAL TIME, TO SPECIFIED ACCURACY, OF GIVEN PROGRAM RAN		M	709TIMA2B
TOCORRELATIONS FOR LONG, LIMITED ACCURACY SERIES	SFAST AU	F	QACORR
T CONVOLUTIONS FOR LONG, LIMITED ACCURACY SERIES	SFAST F	F	QCNVLV
S-CORRELATIONS FOR LONG, LIMITED ACCURACY SERIES	SFAST CROS	F	QXCORR
E SINITIALIZED FOR ADDING TO AN INDATA-OUDATA TAP	F	F	SETINO
ST SCREATE VECTOR OF MACHINE ADDRESSES OF VARIABLES IN A LIST		M	XLOCV
\$HOLLERITH LEFT ADJUST OR RIGHT ADJUST FUNCTION		M	HLADJ
N \$HOLLERITH LEFT ADJUST OR RIGHT ADJUST FUNCTION		M	HLADJ
	\$ADVANCE FILM FRAME ON SCOPE	M	7090FRAME
	\$ADVANCE FILM FRAME ON SCOPE	M	709FRAME
PWARDS OR DOWNDWARDS AN ARBITRARY AMOUNT	\$ROTATE A VECTOR	U	ROTAT1
AND IMAGINARY, OR REVERSE	SAMPLITUDE AND PHASE FROM REAL	M	AMPHZ
TE SYMMETRICAL FILTER WITH GIVEN AMPLITUDE RESPONSE	SGENERA	F	GNFLT1
RAY \$ROTATE CENTRO-SYMMETRIC OR ANTSYMMETRIC 2-DIMENSIONAL AR	F	F	ROAR2
	SARCTANGENT FUNCTION	M	ARCTAN
	\$CORE LOCATION WITH INDEXABLE ARGUMENT	M	LOC
N \$LOCATE ARGUMENT WITH RESPECT TO COMMO	F	F	IXCARG
	\$RETURN N-TH ARGUMENT BEYOND THE FIRST	M	NTHA
TING VALUES	\$FIND IF ARGUMENT FALLS INSIDE TWO LIMITS	M	XLIMIT
WITH REAL COEFFICIENTS FOR REAL ARGUMENTS	SEVALUATE A POLYNOMIAL	F	POLYEV
EVALUATE CUBIC FOR EVENLY SPACED ARGUMENTS	SFAST	M	FASCUB
-0 IS LESS THAN +0	SCOMPARE ARITHMETICALLY TWO WORDS WHERE	M	CMPRA
	SSHIFT VECTOR ELEMENTS ARITHMETICALLY LEFT OR RIGHT	M	SHTR1
C OR ANTSYMMETRIC 2-DIMENSIONAL ARRAY	\$ROTATE CENTRO-SYMMETRIC	F	ROAR2
CED DOT PRODUCT OF 2-DIMENSIONAL ARRAYS	\$DISPLA	F	DOTP
ELATION OF 2-DIMENSIONAL SPATIAL ARRAYS	\$SPATIAL CROSSCORR	F	SPCOP2
R DANIELL SPECTRA	\$MODIFY AUTO- OR CROSS-CORRELATIONS FO	M	ADANL
OSPECTRUM BY COSINE TRANSFORM OF AUTOCORRELATION	SAUT	M	ASPEC2
	SWIENER AUTOCORRELATION	F	WAC
T COSINE TRANSFORMS OF ONE-SIDED AUTOCORRELATIONS	SFAS	M	ASPECT
ITED ACCURACY SERIES	SFAST AUTOCORRELATIONS FOR LONG, LIM	F	QACORR
RM OF AUTOCORRELATION	SAUTOSPECTRUM BY COSINE TRANSFO	M	ASPEC2
NDATA-OUDATA TYPE TAPE	SLIST AUXILIARY INFORMATION FOR AN I	F	LISTING
	\$FIND AVERAGE OF FLOATING VECTOR	M	AVRAGE
ION FROM GIVEN BASE OR FROM TRUE AVERAGE	SR.M.S. DEVIAT	M	RMSDEV
	SMOVING AVERAGE OF A VECTOR	F	MVNAV
	SMOVING MEAN SQUARE AVERAGE OF A VECTOR	F	MVSQAV

T END	\$FIND AVERAGE OF FIXED PT VECTOR	M	XAVRGE
GES	\$TRIANGULAR AVERAGING, MOVING LEFT OR RIGH	M	TAMVL
	\$DIVIDE THE X AXIS INTO EQUALLY PROBABLE RAN	F	GRUP2
	\$SKIP FORWARD OR BACKWARD OVER FILES ON TAPE	M	FSKIP
INE GRAPH	\$BAR GRAPH PLOTTING FOR SUBROUT	M	HSTPLT-II
OR SUM POWER OF DEVIATIONS FROM BASE	\$RAISE VECTOR TO POWER	M	POWER
\$R.M.S. DEVIATION FRCM GIVEN BASE OR FROM TRUE AVERAGE		M	RMSDEV
OPTIONAL ONLINE MONITOR OF BCD TAPE WRITING		M	ONLINE
	\$WRITE BINARY DATA ON TAPE	M	WRTDAT
SREAD EVERY N-TH WORD FROM BINARY TAPE		N	PACDAT
SCHANGE ALL SIGN BITS OF A VECTOR		M	CHSIGN
\$MOVE DATA BLOCK		M	MVBLOK
N LEVEL\$SCAN VECTOR FOR POSSIBLE BLOCK OF VALUES ALL ABOVE GIVE		F	NXALRM
UMMATION OF VECTOR OVER ABUTTING BLOCKS OF CONSTANT LENGTH	\$S	M	BLKSUM
AND OPERATE SUBROUTINES BY PROXY CALL STATEMENTS	\$LOCATE	M	LOCATE
\$GET HOLLERITH DATA FROM CALLING SEQUENCE		F	GETHOL
SENABLE FORTRAN VARIABLE LENGTH CALLING SEQUENCES		M	VARARG
GE	\$SPACE CARRIAGE N LINES OR RESTORE PA	F	CARIGE
RIC 2-DIMENSIONAL ARRAY	\$ROTATE CENTRO-SYMMETRIC OR ANTISSYMET	F	ROAR2
OR	\$CHANGE ALL SIGN BITS OF A VECT	M	CHSIGN
MOVE,REVERSE, CHANGE SPACING, OR CHANGE SIGN OF A VECTOR	\$	M	MOVREV
OF A VECTOR \$MOVE,REVERSE, CHANGE SPACING, OR CHANGE SIGN	M	M	MOVREV
\$GENERATE HOLLERITH CHARACTERS		M	GNHOL2
MAKING ON-LINE REQUEST IF NOT	\$CHECK IF INTERVAL TIMER IS ON	F	CLKON
FALL WITHIN GIVEN LIMITS	\$CHECK THAT VARIABLES FROM LIST	M	LIMITS
EASING OR DECREASING BEHAVIOR	\$CHECK VECTOR FOR MOMOTONE INCR	M	MONOCK
ILITY CASE	\$COMPUTE CHI-SQUARE FOR CONSTANT PROBAB	F	CHISQR
VALUE	\$PROBABILITY THAT A CHI-SQUARED VARIATE EXCEEDS A	F	KIINT1
Y A THIRD ONE BEING ZERO	\$CHOOSE BETWEEN TWO VARIABLES	B	WHICH
LE VECTOR TO INTEGERS FOR SCOPE, CLIPPING EXCESSIVE VALUES	\$SCA	M	SCPSCL
G IN SECONDS USING 7090 INTERVAL CLOCK	\$FOR REAL TIME TIMIN	M	7090CLOCK1
SEVALUATE A POLYNOMIAL WITH REAL COEFFICIENTS FOR REAL ARGUMENT	F	POLYEV	
BOUT ITS MIDPOINT	\$COLLAPSE ODD-LENGTHED VECTOR	A	KOLAPS
SMALLER RANGE	\$COLLAPSE ONE-SIDED VECTOR INTO	M	COLAPS
TERAL FORMATS	\$OUTPUT COLUMN VECTORS BY NORMAL OR LI	M	CVSOUT
INTERPOLATION	\$FIND A MATRIX COLUMN WITH ARBITRARY INDEX BY	M	ARBCOL
T INTEGERS	\$LABEL PRINTER COLUMNS WITH INCREASING 3-DIGI	F	COLABL
\$LOCATE ARGUMENT WITH RESPECT TO COMMON		F	IXCARG
NT OF MEMORY USAGE - PROGRAM AND COMMON	\$OFF-LINE PRI	F	MEMUSE
	\$FIND LENGTH OF COMMON STORAGE	M	XLCOMM
DS WHERE -0 IS LESS THAN +0	\$COMPARE ARITHMETICALLY TWO WOR	M	CMPRA
A SET OF VARIABLES FOR EQUALITY	\$COMPARE PAIRS OF VARIABLES OR	M	CMPARP
TORS FOR IDENTITY	\$FAST COMPARE TWO ARBITRARY MODE VEC	M	CMPARV
	\$COMPLEX POLYNOMIAL EVALUATION	F	IPLYEV
LYNOMIAL SYNTHESIS FROM REAL AND COMPLEX ROOTS	\$PO	F	POLYSN
AL SYNTHESIZED FROM ITS REAL AND COMPLEX ROOTS	\$POLYNOMI	F	PLYSYN
	\$TEST THE CONDITION OF ANY SENSE SWITCH	M	SWITCH
\$DIVIDF A FLOATING VECTOR BY A CONSTANT		M	DIVIDE
VARIABLES BY A SINGLE FLTG. PT. CONSTANT	\$MULTIPLY ANY NO. OF	F	MULK -II
F VECTOR OVER ABUTTING BLOCKS OF CONSTANT LENGTH	\$SUMMATION O	M	BLKSUM

\$MODIFY A SET OF VARIABLES BY A CONSTANT OR BY CONSTANTS	M	ADDK
SCOMPUTE CHI-SQUARE FOR CONSTANT PROBABILITY CASE	F	CHISQR
OR FLTG VECTOR SADD A CONSTANT TO ELEMENTS OF A FXD	M	BOOST
SDIVIDE A FXD VECTOR BY A CONSTANT	M	XDVIDE
OF TWO VECTORS WITH DIVISION BY CONSTANT	M	VDOTV
ING SUMMATION WITH DIVISION BY A CONSTANT	M	MVNSUM
IPLY VECTOR BY FLOATING OR FIXED CONSTANT	M	MULPLY
XED OR FLOATING VECTOR THROUGH A CONSTANT	M	REFLEC
OF VECTOR FROM ANOTHER OR FROM A CONSTANT	M	SUMDFR
LL ELEMENTS OF VECTOR EQUAL TO A CONSTANT (ANY MODE)	M	SETKV
TG VECTOR FROM ANOT' FR OR FROM A CONSTANT\$SUM SQUARE DIF. OF FL	M	SQRDFR
D. VECTOR FROM ANOTHER OR FROM A CONSTANT\$SUM SQUARE DIF. OR FX	M	XSQDFR
OF VARIABLES BY A CONSTANT OR BY CONSTANTS	M	ADDK
M PROBABILITY DENSIT\$MEAN SQUARE CONTINGENCY AND DEPENDENCY FRO	F	MSCON1
R IN DECIBELS	F	CNTRDB
ROW OF DATA	F	CNTROW
F-LINE PRINTER	F	CONTUR
E INTEGERS OR CONVERSELY \$SCALE, CONVERT FLTG. VECTOR TO MACHIN	M	FXDATA
TO MLI VECTOR	M	ITOMLI
ER TO EQUIVALENT HOLLERITH	M	MLI2A6
ACCURACY SERIES	F	CONVLV-II
THER - VERSION 2	F	CONVLV
RGUMENT	M	QCNVLV
COSINE, SINE TRANSFORMS OF CROSS-CORRELATION FUNCTIONS	F	CPYFL2
RA	M	LOC
\$MODIFY AUTO- OR CROSS-CORRELATIONS FOR DANIELL	M	XSPEC
ACCURACY SERIES	F	ADANL
F FIXED POINT INTEGERS	M	QXCORR
FROM 2 OR 4 EVEN-ODD PARTS	M	PROCOR
OF ODD-LENGTH SERIES	M	COSP
S, FIXED OR FLOATING	M	COSIS1
ATION	M	COSTBL
AUTOCORRELATIONS	M	ASPEC2
SS-CORRELATION FUNCTIONS	F	ASPECT
FUNCTIONS FOR SEQUENTIAL SINES AND COSINES	M	XSPEC
SERIES IN GIVEN RANGES	F	SEQSAC
WITH NEW RANGE AND INCREMENT	M	FROCT2
SSFS OF VARIABLES IN A LIST	M	NURINC
\$FAST COSINF, SINF TRANSFORMS OF CROSS-CORRELATION FUNCTIONS	F	XLOCV
SPFCTRA	M	XSPEC
IMITED ACCURACY SERIES	F	ADANL
VECTORS OF MATRICES	F	QXCORR
BEGINNING WITH ANY LAG	F	CRSVM
BEGINNING WITH ZERO LAG	F	CROST
NAL SPATIAL ARRAYS	F	CROSS
ENTS	F	SPCOP2
SUBROUTINE GRAPH	F	QXCOR1
SUBROUTINE GRAPH	M	HSTPLT-III
NTS	M	HSTPLT-III
	M	FASCUB
\$FAST EVALUATE CUBIC FOR EVENLY SPACED ARGUME	M	

PFED EXPANSION OF A VECTOR UNDER CUBIC INTERPOLATION	\$HI-S	M	EXPAND
ALLY SPACED POINTS	\$FIND CURVE WHICH EXACTLY FITS 4 EQU	M	CUFIT1
UTINF GRAPH	\$CUBIC CURVE SCOPE PLOTTING FOR SUBRO	M	HSTPLT-III
UTINF GRAPH	\$CUBIC CURVE SCOPE PLOTTING FOR SUBRO	M	HSTPLT-III
AUTO- OR CROSS-CORRELATIONS FOR DANIELL SPECTRA	\$MODIFY	M	ADANL
	\$MOVE DATA BLOCK	M	MVBLOK
	\$READ DATA IN GENERALIZED FORMAT	F	RDATA
	\$WRITE BINARY DATA ON TAPE	M	WRTDAT
CALE AND FIX DATA VECTOR, PACK N DATA POINTS PER REGISTER	\$S	M	PAKN
OR	\$REREAD DATA RECORD AND END FILE MONIT	M	REREAD
	\$FAST AND CONVENT DATA STORAGE ON TAPE	F	OUDATA
	\$UNPACK AND RESCALE A PACKED DATA VECTOR	M	UNPAKN
S PER REGISTER	\$SCALE AND FIX DATA VECTOR, PACK N DATA POINT	M	PAKN
NTOUR A MATRIX ON THE PRINTER IN DECIBELS	\$CO	F	CNTRDB
AND REPOSITION TAPE TO FRONT OF DECK	\$LIST DATA DECK	F	DADECK
ONT OF DECK	\$LIST DATA DECK AND REPOSITION TAPE TO FR	F	DADECK
ECTOR FOR MOMOTONE INCREASING OR DECREASING BEHAVIOR	\$CHECK V	M	MONOCK
OF FUNCTION OR ITS MAGNITUDE	\$DEFINITE TRAPEZOIDAL INTEGRAL	M	TINGL
ONS, FLOATING AND FIXED POINT	\$DELTA FUNCTION AND STEP FUNCTI	M	DELTA
AND DEPENDENCY FROM PROBABILITY DENSIT	\$MEAN SQUARE CONTINGENCY	F	MSCON1
IVEN LAG	\$SECOND PROBABILITY DENSITY OF INTEGER SERIES AT G	F	PROB2
NSITS\$MEAN SQUARE CONTINGENCY AND DEPENDENCY FROM PROBABILITY DE	F	MSCON1	
FERENCING	\$DERIVATIVE OF A VECTOR OF DIFF	M	DERIVA
ON OF SIMULTANEOUS EQUATIONS AND DETERMINANT EVALUATION	\$SOLUTI	M	SIMEQ
ROM TRUE AVERAGE	\$R.M.S. DEVIATION FROM GIVEN BASE OR	F	RMSDEV
VFCOT TO POWER OR SUM POWER OF DEVIATIONS FROM BASE	\$RAISE	M	POWER
EFCOT ELEMENTS IN PAIRS	\$DIFFERENCE FIXED OR FLOATING	M	DIFPRS
IF SAME INCLUDING SIGN	\$SIGN OF DIFFERENCE OF 2 VARIABLES OR 0	M	XACTEQ
HER OR FROM A CONSTANT	\$SUM DIFFERENCE OF VECTOR FROM ANOT	M	SUMDFR
ER OR FROM A CONSTANT\$SUM SQUARE DIF.	OF FLTG VECTOR FROM ANOTH	M	SQRDFR
ER OR FROM A CONSTANT\$SUM SQUARE DIF.	OR FXD. VECTOR FROM ANOTH	M	XSQDFR
	\$DERIVATIVE OF A VECTOR OF DIFFERENCING	M	DERIVA
\$INVERSION OF DIFFERENTIATION BY DIFFERENCING		M	IDERIV
G	\$INVERSION OF DIFFERENTIATION BY DIFFERENCIN	M	IDERIV
RINTER COLUMNS WITH INCREASING 3-DIGIT INTEGERS	\$LABEL	P F	COLABL
NE FOR RAND CORP. MILLION RANDOM DIGITS FROM TAPE	\$ACCESS ROUTI	F	GETRD1
QUARES PREDICTOR BY RECURSION, 1-DIMENSION	\$REALIZABLE LEAST	S F	RLSPR
	\$DISPLACED DOT PRODUCT OF 2-DIMENSIONAL ARRAYS	F	DOTP
N	\$TWO-DIMENSIONAL FILTER BY RECURSIO	F	FIRE2
TRO-SYMMETRIC OR ANTISYMMETRIC 2-DIMENSIONAL ARRAY	\$ROTATE CEN	F	ROAR2
	\$SPATIAL CROSSCORRFATION OF 2-DIMENSIONAL SPATIAL ARRAYS	F	SPCOP2
	\$FAST TWO-DIMENSIONAL SPATIAL SPECTRUM	F	PLANS
QUARES PREDICTOR BY RECURSION, 2-DIMENSIONS	\$REALIZABLE LEAST	S F	RLSPR2
T GENERATOR FOR SCOPE SUBROUTINE DISPLA	\$VARIABLE ORIGIN FORMA	M	DSPFMT
ENSIONAL ARRAYS	\$DISPLACED DOT PRODUCT OF 2-DIM	F	DOTP
VECTOR	\$FREQUENCY DISTRIBUTION OF A FIXED POINT	F	FRQCT1
EQUALLY LIKELY SECTIONS	\$NORMAL DISTRIBUTION AND DIVISION INTO	M	NOINT1
\$REGION TO MAXIMIZE RATIO OF TWO DISTRIBUTION FUNCTIONS		F	MXRARE
MENTS	\$GENERATE PROBABILITY DISTRIBUTION WITH SPECIFIED MO	F	PRBFIT
CONSTANT	\$DIVIDE A FLOATING VECTOR BY A	M	DIVIDE

PROBABLE RANGES	\$DIVIDE THE X AXIS INTO EQUALLY F	GRUP2
ANT	\$DIVIDE A FXD VECTOR BY A CONST M	XDVIDE
BY THOSE OF ANOTHER	\$DIVIDE ELEMENTS OF ONE VECTOR M	VDVBYV
FACTORS WITH OR WITHOUT ROUNDING	\$DIVIDE ELEMENTS OF TWO FIXED V M	XDVVBV
DING TO FORTRAN-II INTEGF\$FXD PT	DIVIDE WITH TRUNCATION OR ROUN M	XDIV
MOVING SUMMATION WITH DIVISION BY A CONSTANT	M	MVNSUM
SDOT PRODUCT OF TWO VECTORS WITH DIVISION BY CONSTANT	M	VDOTV
SECTIONS SNORMAL DISTRIBUTION AND DIVISION INTO EQUALLY LIKELY S M	M	NOINTI
RRAYS	SPEFORM LONG DIVISION OF TWO POLYNOMIALS F	POLYDV
	\$DISPLACED DOT PRODUCT OF 2-DIMENSIONAL A F	DOTP
	SFAST DOT PRODUCT OF TWO VECTORS M	FDOT
ICES	\$DOT PRODUCT OR REVERSED DOT PRODUCT OF VECTORS OF MATR F	MDOT3
ICES	\$DOT PRODUCT OR REVERSED DOT PRODUCT OF VECTORS OF MATR F	MDOT
ODUCT OF VECTORS OF MATRICES	\$DOT PRODUCT OR REVERSED DOT PR F	MDOT3
ODUCT OF VECTORS OF MATRICES	\$DOT PRODUCT OR REVERSED DOT PR F	MDOT
REMENTS	SVECTOR DOT PRODUCT WITH ARBITRARY INC M	DOTJ
H DIVISION BY CONSTANT	\$DOT PRODUCT OF TWO VECTORS WIT M	VDOTV
R (FIXED OR FLOATING)	SFAST DOUBLING OR HALVING OF A VECTO M	DUBLX
GIVEN VALUES	SFAST SCAN VECTOR FOR ELEMENT EQUAL OR GREATER THAN M	FASCN1
SEXTREMAL VALUES OF MATRIX ELEMENTS	M	MAXSNM
FERENCE FIXED OR FLOATING VECTOR ELEMENTS IN PAIRS	SDIF M	DIFPRS
OR	\$ADD A CONSTANT TO ELEMENTS OF A FXD OR FLTG VECT M	BOOST
R RIGHT	SSHIFT VECTOR ELEMENTS ARITHMETICALLY LEFT O M	SHFTR1
KE INDEX (BY INCREASING SIZE) OF ELEMENTS IN A VECTOR	SFAST MA M	SIZEUP
HT	SSHIFT VECTOR ELEMENTS LOGICALLY LEFT OR RIG M	SHFTR2
OR	S\$UM THE SQUARED ELEMENTS OF A FLTG OR FXD VECT M	SQRSUM
INTEGER VECTOR	SFAST SQUARE ELEMENTS OF A MACHINE LANGUAGE M	SQRMLT
VECTOR	S\$UM ELEMENTS OF FLOATING OR FIXED M	SUM
	SSQUARE ELEMENTS OF FXD OR FLTG VECTOR M	SQUARE
E OF ANOTHER	\$DIVIDE ELEMENTS OF ONE VECTOR BY THOS M	VDVBYV
WITH OR WITHOUT ROUNDING	\$DIVIDE ELEMENTS OF TWO FIXED VECTORS M	XDVVBV
OR FLOATING	SMULTIPLY ELEMENTS OF TWO VECTORS FIXFD M	VTIMSV
CONSTANT (ANY MODE)	SSET ALL ELEMENTS OF VECTOR EQUAL TO A M	SETKV
CALLING SEQUENCES	SENABLE FORTRAN VARIABLE LENGTH M	VARARG
RTRAN	SENABLE MIXED EXPRESSIONS IN FO M	SAME
AVERAGING, MOVING LEFT OR RIGHT END	STRIANGULAR M	TAMVL
	\$REREAD DATA RECORD AND END FILE MONITOR	REREAD
E	\$TEST IF NEXT TAPE RECORD IS END OF FILE AND REPOSITION TAP M	ZEFBCD
LUES	SFAST SCAN VECTOR FOR ELEMENT EQUAL OR GREATER THAN GIVEN VA M	FASCN1
	SPRINTER PLOT OF A SET OF EQUAL LENGTH VECTORS F	PLTVS1
	SSET ALL ELEMENTS OF VECTOR EQUAL TO A CONSTANT (ANY MODE) M	SETKV
	S SET FXD OR FLTG VECTOR EQUAL TO A LINEAR SEGMENT M	SETLIN
R (FLTG)	SSET ANY NO. OF VARIABLES EQUAL TO A SINGLE VALUE (FXD O F	SETK -II
OR FLTG)	SSET ANY NO. OF VECTORS EQUAL TO SEPARATE VALUES (FXD M	SETKVS
IABLES	SSET ANY NO. OF VARIABLES EQUAL TO SEPARATE VALUES (FXD F	SETKS -II
	SCOMPARE PAIRS OF VAR M	CMPARP
	\$DIVIDE THE X AXIS INTO EQUALLY PROBABLE RANGES F	GRUP2
SFIND CUBIC WHICH EXACTLY FITS 4 F JALLY SPACED POINTS M	CUFIT1	
L DISTRIBUTIRATION AND DIVISION INTO EQUALLY LIKELY SECTIONS SNORMA M	NOINT1	
D QUADRATIC WHICH EXACTLY FITS 5 EQUALLY SPACED POINTS SFIN M	QUFIT1	

UATION \$SOLUTION OF SIMULTANEOUS EQUATIONS AND DETERMINANT EVAL M	SIMEQ
VERT MACHINE LANGUAGE INTEGER TO EQUIVALENT HOLLERITH SCON M	MLI2A6
SWIENER-LEVINSON LEAST SQUARE ERROR FILTER OR PREDICTOR F	WLLSFP
ED ARGUMENTS \$FAST EVALUATE CUBIC FOR EVENLY SPAC M	FASCUB
L COEFFICIENTS FOR REAL ARGUMENT\$EVALUATE A POLYNOMIAL WITH REA F	POLYEV
SCOMPLEX POLYNOMIAL EVALUATION F	IPLYEV
ANEQUATIONS AND DETERMINANT EVALUATION \$SOLUTION OF SIMULT M	SIMEQ
IN GROUPS OF FIVE AS POKER HAND\$EVALUATION OF INTEGER SEQUENCE F	POKCT1
1 \$SPLIT A VECTOR INTO ITS EVEN AND ODD PARTS (OR INVERSE M	SPLIT
M A VECTOR BY SIFTING ANOTHER AT EVEN INCREMENTS \$FOR M	SIFT
NE WHETHER FORTRAN-II !INTEGER IS EVEN OR ODD \$DETERM M	XOOZE
D/OR SINE TRANSFORMS FROM 2 OR 4 EVEN-ODD PARTS \$FAST COSINE AN M	COSP
\$FAST EVALUATE CUBIC FOR EVENLY SPACED ARGUMENTS M	FASCUB
INTERPOLATION OPERATOR FOR 1 TO 4 EVENLY SPACED DATA VALUES \$I M	INTOPR
TO INTEGERS FOR SCOPE, CLIPPING EXCESSIVE VALUES \$SCALE VECTOR M	SCPSCL
SEXCHANGE ANY TWO VECTORS M	EXCHVS
\$SUBROUTINE GRAPH EXPANDED OVER VERTICAL FRAMES F	GRAPHX
BIC INTERPOLATION \$HI-SPEED EXPANSION OF / VECTOR UNDER CU M	EXPAND
SENABLE MIXED EXPRESSIONS IN FORTRAN M	SAME
\$FIND SIGNED OR UNSIGNED EXTREMAL VALUES OF A VECTOR M	MAXSN
FNTS \$EXTREMAL VALUES OF MATRIX ELEM M	MAXSNM
FINITE MATRIX \$FACTOR A SYMMETRIC POSITIVE DE F	MFACT
MINIMUM PHASE WAVELET \$FACTOR POWER SPECTRUM TO FIND M	FACTOR
R \$FACTOR ABSOLUTE VALUE OF A VECTO M	ABSV
OF DATA FROM A SPECIAL TAPE \$FACTOR A' CONVENIENT RETRIEVAL F	INDATA
EGMENT ON SCOPE \$FAST ARBITRARY STRAIGHT LINE S M	709OLINE
EGMENT ON SCOPE \$FAST ARBITRARY STRAIGHT LINE S M	709LINE
E VECTORS FOR IDNITY \$FAST COMPARE TWO ARBITRARY MOD M	CMPARV
ECTOR TO MLI VECTOR \$FAST CONVERT FORTRAN INTEGER V M	ITOMLI
O ANOTHER - VERSION 2 \$FAST COPY FILE FROM ONE TAPE T M	TPYFL2
ORMS FROM 2 OR 4 EVEN-ODD PARTS \$FAST COSINE AND/OR SINE TRANSF M	COSP
ORMS OF ODD-LENGTH SERIES \$FAST COSINE AND/OR SINE TRANSF F	COSIS1
SIDED AUTOCORRELATIONS \$FAST COSINE TRANSFORMS OF ONE- M	ASPECT
S \$FAST DOT PRODUCT OF TWO VECTOR M	FDOT
VECTOR (FIXED OR FLOATING) \$FAST DOUBLING OR HALVING OF A M	DUBLX
SPACED ARGUMENTS \$FAST EVALUATE CUBIC FOR EVENLY M	FASCUB
SPL0T FAST HORIZONTAL LINE ON SCOPE M	709OLINEH
SPL0T FAST HORIZONTAL LINE ON SCOPE M	709LINEH
RS ,AS PRODUCED BY SPLTT. \$FAST REVERSAL OF SPECIAL VECTO M	CHPRTS
QUAL OR GREATER THAN GIVEN VALUES \$FAST SCAN VECTOR FOR ELEMENT E M	FASCN1
INDICES \$FAST TRACK THROUGH A VECTOR OF M	FASTRK
ON TAPE \$FAST AND CONVENT DATA STORAGE F	ODATA
• LIMITED ACCURACY SERIES \$FAST AUTOCORRELATIONS FOR LONG F	QACORR
MITED ACCURACY SFRFS \$FAST CONVOLUTIONS FOR LONG, LI F	QCNVLV
IES OF FIXED POINT INTEGERS \$FAST CORRELATIONS FOR LONG SER M	PROCOR
F CROSS-CORRELATION FUNCTIONS \$FAST COSINE, SINE TRANSFORMS O F	XSPEC
NG, LIMITED ACCURACY SERIES \$FAST CROSS-CORRELATIONS FOR LO F	QXCORR
SIFT WITH ARBITRARY TIME ORIGIN\$FAST FOURIER TRANSFORM OF TRAN F	QFURRY

SINES AND COSINES SIZE) OF ELEMENTS IN A VECTOR ED POINT VECTOR A VECTOR	\$FAST FUNCTIONS FOR SEQUENTIAL M \$FAST MAKE INDEX (BY INCREASING M \$FAST MOVING SUMMATION OF A FIX M \$FAST REVERSE STORAGE ORDER OF M \$FAST SET VECTOR TO ZERO M	SEQSAC SIZEUP MUVADD REVERS STZ
INE LANGUAGE INTEGER VECTOR PECTRUM	\$FAST SQUARE ELEMENTS OF A MACH M \$FAST TWO-DIMENSIONAL SPATIAL S F	SQRMLI PLANSPI
	SGENERATE HOLLERITH FIELD M	GENHOL
- VERSION 2	\$FAST COPY FILE FROM ONE TAPE TO ANOTHER M	CPYFL2
ST IF NEXT TAPE RECORD IS END OF FILE AND REPOSITION TAPE	\$TE M	ZEFBCD
SREREAD DATA RECORD AND END FILE MONITOR	M	REREAD
\$SKIP FORWARD OR BACKWARD OVER FILES ON TAPE	M	FSKIP
	\$ADVANCE FILM FRAME ON SCOPE M	7090FRAME
	\$ADVANCE FILM FRAME ON SCOPE M	709FRAME
	\$MULTI-INPUT FILTER BY LEAST SQUARES F	MIFLS
	\$TWO-DIMENSIONAL FILTER BY RECURSION F	FIRE2
SPONSE	SGENERATE SYMMETRICAL FILTER WITH GIVEN AMPLITUDE RE F	GNFLT1
ENER-LEVINSON LEAST SQUARE ERROR FILTER OR PREDICTOR	\$WI F	WLLSFP
	\$FIND CUBIC WHICH EXACTLY FITS 4 EQUALLY SPACED POINTS M	CUFIT1
	\$FIND QUADRATIC WHICH EXACTLY FITS 3 EQUALLY SPACED POINTS M	QUFIT1
WITHOUT ROUNDING	\$FIX A FLOATING VECTOR WITH OR M	FIXV
oints per register	\$SCALE AND FIX DATA VECTOR, PACK N DATA P M	PAKN
DOUBLING OR HALVING OF A VECTOR (FIXED OR FLOATING)	\$FAST M	DUBLX
COSINE OR SINE HALF-WAVE TABLES, FIXED OR FLOATING	SGENERATE M	COSTBL
NTS IN PAIRS	\$DIFFERENCE FIXED OR FLOATING VECTOR ELEMEN M	DIFPRS
AND STEP FUNCTIONS, FLOATING AND FIXED POINT	\$DELTA FUNCTION M	DELTA
TIPLY AN MLI VECTOR BY A FORTRAN FIXED POINT INTEGER	\$MUL M	MLISCL
	\$FREQUENCY DISTRIBUTION OF A FIXED POINT VECTOR F	FREQCT1
RATED SUMMATION OF A FLOATING OF FIXED VECTOR	\$INTEG M	INTSUM
	\$SET LINEAR VECTORS, FIXED AND/OR FLOAT+NG M	SETLNS
	\$MULTIPLY VECTOR BY FLOATING OR FIXED CONSTANT M	MULPLY
MULTIPLY ELEMENTS OF TWO VECTORS FIXED OR FLOATING	\$ M	VTIMSV
GH A CONSTAN:	\$REFLECT A FIXED OR FLOATING VECTOR THROU M	REFLEC
CORRELATIONS FOR LONG SERIES OF FIXED POINT INTEGERS	\$FAST M	PROCOR
	\$FAST MOVING SUMMATION OF A FIXED POINT VECTOR M	MUVADD
	\$FIND AVERAGE OF FIXED PT VECTOR M	XAVRGE
	\$REMOVE THE MEAN FROM A FIXED VECTOR M	XREMAV
	\$SUM ELEMENTS OF FLOATING OR FIXED VECTOR M	SUM
	\$SQUARE ROOT OF A FIXED VECTOR WITH ROUNDING M	XSQRUT
\$ADD OR SUBTRACT TWO FLOATING OR FIXED VECTORS	M	VPLUSV
ROUNDING	\$DIVIDE ELEMENTS OF TWO FIXED VECTORS WITH OR WITHOUT M	XVDVBV
TEGER	\$FLOAT A VECTOR M	FLOATV
OR HALVING OF A VECTOR (FIXED OR FLOATING)	\$FAST DOUBLING M	DUBLX
SINE HALF-WAVE TABLES, FIXED OR FLOATING	SGENERATE COSINE OR M	COSTBL
LTA FUNCTION AND STEP FUNCTIONS, FLOATING AND FIXED POINT	\$DE M	DELTA
	\$INTEGRATED SUMMATION OF A FLOATING OF FIXED VECTOR M	INTSUM
	\$FIND AVERAGE OF FLOATING VECTOR M	AVRAGE
IRS	\$DIVIDE A FLOATING VECTOR BY A CONSTANT M	DIVIDE
	\$DIFFERENCE FIXED OR FLOATING VECTOR ELEMENTS IN PA M	DIFPRS

T ROUNDING	\$FIX A FLOATING VECTOR WITH OR WITHOUT	M	FIXV
SET LINEAR VECTORS, FIXED AND/OR FLOAT+NG		\$ M	SETLNS
ELEMENTS OF TWO VECTORS FIXED OR FLOATING	\$MULTIPLY	M	VTIMSV
	\$MULTIPLY VECTOR BY FLOATING OR FIXED CONSTANT	M	MULPLY
	\$SUM ELEMENTS OF FLOATING OR FIXED VECTOR	M	SUM
INTEGER	\$ADD OR SUBTRACT TWO FLOATING OR FIXED VECTORS	M	VPLUSV
	\$TRUNCATE OR ROUND FLOATING PT. NUMBER TO MACHINE	M	XFI XM
	\$REMOVE THE MEAN FROM A FLOATING VECTOR	M	REMAV
ROUND, ROUND UP, OR ROUND DOWN A FLOATING VECTOR	\$ M	RNDV	
	\$SQUARE ROOT OF A FLOATING VECTOR	M	SQROOT
TANT	\$REFLECT A FIXED OR FLOATING VECTOR THROUGH A CONS	M	REFLEC
CONSTANT TO ELEMENTS OF A FXD OR FLTG VECTOR	\$ADD A	M	BOOST
ANY NO. OF VARIABLES BY A SINGLE FLTG. PT. CONSTANT	\$MULTIPLY	F	MULK -II
RS OR CONVERSELY \$SCALE, CONVERT FLTG. VECTOR TO MACHINE INTEGE	M	FXDATA	
EQUAL TO A SINGLE VALUE (FXD OR FLTG) \$SET ANY NO. OF VARIABLES	F	SETK -II	
EQUAL TO SEPARATE VALUES (FXD OR FLTG) \$SET ANY NO. OF VECTORS	M	SETKV S	
\$SUM THE SQUARED ELEMENTS OF A FLTG OR FXD VECTOR	M	SQRSUM	
	\$SQUARE ELEMENTS OF FXD OR FLTG VECTOR	M	SQUARE
SEGMENT	\$ SET FXD OR FLTG VECTOR EQUAL TO A LINEAR	M	SETLIN
OM A CONSTANT\$SUM SQUARE DIF. OF FLTG VECTOR FROM ANOTHER OR FR	M	SQRDFR	
EQUAL TO SEPARATE VALUES (FXD OR FLTGSSET ANY NO. OF VARIABLES	F	SETKS -II	
PT. NO. UP, DOWN, OR TO NEAREST FLTG. PT. INTEGER SROUND FLTG.	M	RND	
NEAREST FLTG. PT. INTEGER \$ROUND FLTG. PT. NO. UP, DOWN, OR TO	M	RND	
\$ACCESS TO LITERAL OR ORDINARY FORMAT	M	FNDFMT	
	\$MATRIX OUTPUT IN G FORMAT	F	MOUT
PUT VARIABLES FIVE PER LINE IN G FORMAT		SOUT	CSOUT
ROUTINE DISPLA \$VARIABLE ORIGIN FORMAT GENERATOR FOR SCOPE SUB	M	DSPFMT	
TPUT TAPE WITH NORMAL OR LITERAL FORMAT VECTOR	SWRITE OU	F	FMTOUT
OR OUTPUT WITH NORMAL OR LITERAL FORMAT	\$OFFLINE VECT	F	VECOUT
T VARIABLES BY NORMAL OR LITERAL FORMAT	SOUTPU	M	VRSOUT
\$READ DATA IN GENERALIZED FORMAT	F	RDATA	
R OUTPUT STATEMENT \$REPLACE THE FORMAT OF A SUCCEEDING INPUT O	M	RPLFMT	
AMED VECTOR BY NORMAL OR LITERAL FORMAT WITH SPACING \$OUTPUT N	F	VOUT	
UMN VECTORS BY NORMAL OR LITERAL FORMATS	\$OUTPUT COL	M	CVSOUT
MED VECTORS BY NORMAL OR LITERAL FORMATS WITH SPACING\$OUTPUT NA	M	VSOUT	
\$MULTIPLY AN MLI VECTOR BY A FORTRAN FIXED POINT INTEGFR	M	MLISCL	
ERITH VECTOR	\$PACK UP FORTRAN INTEGER VECTOR AS HOLL	M	IVTOHV
VECTOR	\$FAST CONVERT FORTRAN INTEGER VECTOR TO MLI	M	ITOMLI
\$SPREAD OUT HOLLERITH VECTOR AS FORTRAN INTEGERS	M	HVTIOV	
SENABLE MIXED EXPRESSIONS IN FORTRAN	M	SAME	
F WITH TRUNCATION OR ROUNDING TO FORTRAN-II INTEGER\$FXD PT DIVID	M	XDIV	
ODD	\$DETERMINE WHETHER FORTRAN-II INTEGER IS EVEN OR	M	XOOZE
G SEQUENCES	SENABLE FORTRAN VARIABLE LENGTH CALLIN	M	VARARG
WITH ARBITRARY TIME ORIGINS\$FAST FOURIER TRANSFORM OF TRANSIENT	F	QFURRY	
RY TIME ORIGIN	\$QUICK INVERSE FOURIER TRANSFORM WITH ARBITRA	F	QIFURY
	\$ADVANCE FILM FRAME ON SCOPE	M	7090FRAME
	\$ADVANCE FILM FRAME ON SCOPE	M	709FRAME
TS	\$MULTIPLE FRAME SCOPE PLOTS OF VECTOR SE	F	GRAPH
INE GRAPH EXPANDED OVER VERTICAL FRAMES	\$SUBROUT	F	GRAPHX
ALUES OF A SERIES IN GIVEN RANGE\$FREQUENCY COUNT OF NUMBER OF V	M	FRQCT2	

XED POINT VECTOR	\$FREQUENCY DISTRIBUTION OF A FI F	FROCT1
SARCTANGENT FUNCTION	M	ARCTAN
RITH LEFT ADJUST OR RIGHT ADJUST FUNCTION	SHOLLE M	HLADJ
SLOGICAL SHIFT FUNCTION	M	LSHFT
LOATING AND FIXED POINT	\$DELTA FUNCTION AND STEP FUNCTIONS, F M	DELTA
ON	\$INVERSION OF A MONOTONE FUNCTION BY LINEAR INTERPOLATI M	IFNCTN
DEFINITE TRAPEZOIDAL INTEGRAL OF	FUNCTION OR ITS MAGNITUDE \$ M	TINGL
POINT	\$DELTA FUNCTION AND STEP FUNCTIONS, FLOATING AND FIXED M	DELTA
TRANSFORMS OF CROSS-CORRELATION FUNCTIONS	\$FAST COSINE, SINE F	XSPEC
XIMIZE RATIO OF TWO DISTRIBUTION FUNCTIONS	SREGION TO MA F	MXRARE
AND COSINES	\$FAST FUNCTIONS FOR SEQUENTIAL SINES M	SEQSAC
\$ADD A CONSTANT TO ELEMENTS OF A FXD OR FLTG VECTOR	M	BOOST
ECTORS EQUAL TO SEPARATE VALUES (FXD OR FLTG)	\$SET ANY NO. OF V M	SETKVS
RIABLES EQUAL TO A SINGLE VALUE (FXD OR FLTG)	\$SET ANY NO. OF VA F	SETK -II
	\$SQUARE ELEMENTS OF FXD OR FLTG VECTOR M	SQUARE
LINEAR SEGMENT	\$ SET FXD OR FLTG VECTOR EQUAL TO A M	SETLIN
IABLES EQUAL TO SEPARATE VALUES (FXD OR FLTG)	\$SET ANY NO. OF VAR F	SETKS -II
OR ROUNDING TO FORTRAN-II INTEGE	PT DIVIDE WITH TRUNCATION M	XDIV
HE SQUARED ELEMENTS OF A FLTG OR FXD VECTOR	\$SUM T M	SQRSUM
	\$DIVIDE A FXD VECTOR BY A CONSTANT M	XDVIDE
OM A CONSTANT	\$SUM SQUARE DIF. OR FXD. VECTOR FROM ANOTHER OR FR M	XSQDFR
	\$MATRIX OUTPUT IN G FORMAT F	MOUT
UTPUT VARIABLES FIVE PER LINE IN G FORMAT	SO M	CSOUT
AVE TABLES, FIXED OR FLOATING	\$GENERATE COSINE OR SINE HALF-W M	COSTBL
	\$GENERATE HOLLERITH CHARACTERS M	GNHOL2
	\$GENERATE HOLLERITH FIELD M	GENHOL
TH GIVEN AMPLITUDE RESPONSE	\$GEN_L RATE SYMMETRICAL FILTER WI F	GNFLT1
ION WITH SPECIFIED MOMENTS	\$GENERATE PROBABILITY DISTRIBUT F	PRBFIT
DISPLA	\$VARIABLE ORIGIN FORMAT GENERATOR FOR SCOPE SUBROUTINE M	DSPFMT
AR GRAPH PLOTTING FOR SUBROUTINE GRAPH	SB M	HSTPLT-II
VE SCOPE PLOTTING FOR SUBROUTINE GRAPH	\$CUBIC CUR M	HSTPLT-III
VE SCOPE PLOTTING FOR SUBROUTINE GRAPH	\$CUBIC CUR M	HSTPLT-III
ISTOGRAM PLOTTING FOR SUBROUTINE GRAPH	SH M	HSTPLT
RAMES	\$SUBROUTINE GRAPH EXPANDED OVER VERTICAL F F	GRAPHX
GRAPH	SBAR GRAPH PLOTTING FOR SUBROUTINE M	HSTPLT-II
VALUATION OF INTEGER SEQUENCE IN GROUPS OF FIVE AS POKER HANDSE F	POKCT1	
ATING	\$GENERATE COSINE OR SINE HALF-WAVE TABLES, FIXED OR FLO M	COSTBL
FLOATING)	\$FAST DOUBLING OR HALVING OF A VECTOR (FIXED OR M	DUBLX
UEENCE IN GROUPS OF FIVE AS POKER HAND\$EVALUATION OF INTEGER SEQ F	POKCT1	
UNDER CUBIC INTERPOLATION	SHI-SPEED EXPANSION OF A VECTOR M	EXPAND
	SHIGH SPEED 24 POINT SPECTRUM F	FT24 -II
	SHIGH SPEED 24 POINT SPECTRUM M	FT24
INE GRAPH	SHISTOGRAM PLOTTING FOR SUBROUT M	HSTPLT
E LANGUAGE INTEGER TO EQUIVALENT HOLLERITH	\$CONVERT MACHIN M	ML12A6
	\$INTERPRET HOLLERITH M	INTHOL
QUENCE	\$GENERATE HOLLERITH CHARACTERS M	GNHOL2
	SGET HOLLERITH DATA FROM CALLING SE F	GETHOL
ADJUST FUNCTION	SHOLLERITH LEFT ADJUST OR RIGHT M	GENHOL
	SWRITE HOLLERITH TEXT ON SCOPE M	HLADJ
		7090DISPLA

ACK UP FORTRAN INTEGER VECTOR AS HOLLERITH VECTOR	SP M	709DISPLA
TEGERS		IVTOH
SSPREAD OUT HOLLERITH VECTOR AS FORTRAN IN	M	HVT0IV
F TWO ARBITRARY MODE VECTORS FOR IDENTITY	\$FAST COMPAR M	CMPARV
MPLITUDE AND PHASE FROM REAL AND IMAGINARY, OR REVERSE	\$A M	AMPHZ
SLABEL PRINTER COLUMNS WITH INCREASING 3-DIGIT INTEGERS	F	COLABL
FOR \$CHECK VECTOR FOR MOMOTONE INCREASING OR DECREASING BEHAV	M	MONOCK
N A VECTOR \$FAST MAKE INDEX (BY INCREASING SIZE) OF ELEMENTS I	M	SIZEUP
FROM ANOTHER WITH NEW RANGE AND INCREMENT SCREATE ONE VECTOR	M	NURINC
TING SHYBIRD SUBPROGPAMS FOR INCREMENTING, TESTING, AND SET	M	INDEX
ECTOR DOT PRODUCT WITH ARBITRARY INCLEMENTS	\$V M	DOTJ
ECTOR BY SIFTING ANOTHER AT EVEN INCREMENTS	\$FORM A V M	SIFT
IST AUXILIARY INFORMATION FOR AN INDATA-OUDATA TYPE TAPE	SL F	LISTING
SINITIALIZED FOR ADDING TO AN INDATA-OUDATA TAPE	F	SETINO
STERMINATE AN INDATA-OUDATA TAPE	F	TRMINO
IDAL RULE	SINDEFINITE INTEGRAL BY TRAPEZO M	INTGRA
D A MATRIX COLUMN WITH ARBITRARY INDEX BY INTERPOLATION	\$FIN M	ARBCOL
ELEMENTS IN A VECTOR \$FAST MAKE INDEX (BY INCREASING SIZE) OF	M	SIZEUP
SCORE LOCATION WITH INDEXABLE ARGUMENT	M	LOC
SALLWS VARIABLE DEPTH INDEXING OF VECTORS	M	GETX
\$FAST TRACK THROUGH A VECTOR OF INDICES	M	FASTRK
NDATA-OUDATA TAPE	SINITIALIZED FOR ADDING TO AN I F	SETINO
ES	\$MULTI-INPUT FILTER BY LEAST SQUARES F	MIFLS
	\$MULTI-INPUT PREDICTOR BY LEAST SQUAR F	MIPLS
	\$MULTI-INPUT SIDEWARDS ITERATION F	MISS
PLACE THE FORMAT OF A SUCCEEDING INPUT OR OUTPUT STATEMENT	\$RE M	RPLFMT
\$FLOAT ANY MACHINE LANGUAGE INTEGER	M	FLOATM
VECTOR BY A FORTRAN FIXED POINT INTEGER	\$MULTIPLY AN MLI M	MLISCL
AP A SEQUENCE OF NUMBERS INTO AN INTEGER SERIES	SM M	MPSEQ1
H SCONVERT MACHINE LANGUAGE INTEGER TO EQUIVALENT HOLLERIT	M	MLI2A6
CTOF \$PACK UP FORTRAN INTEGER VECTOR AS HOLLERITH VE M		IVTOHV
\$FAST CONVERT FORTRAN INTEGER VECTOR TO MLI VECTOR M		ITOMLI
ATION OR ROUNDING TO FORTRAN-II INTEGER&FXD PT DIVIDE WITH TRUN M		XDIV
P, DOWN, OR TO NEAREST FLTG. PT. INTEGER \$ROUND FLTG. PT. NO. U M		RND
D FLOATING PT. NUMBER TO MACHINE INTEGER STRUNCATE OR ROUN M		XFIXM
SDETERMINE WHETHER FORTRAN-II INTEGER IS EVEN OR ODD M		XOOZE
FIVE AS POKER HAND\$EVALUATION OF INTEGER SEQUENCE IN GROUPS OF F		POKCT1
\$SECODN PROBABILITY DENSITY OF INTEGER SERIES AT GIVEN LAG F		PROB2
E ELEMENTS OF A MACHINE LANGUAGE INTEGER VECTOR \$FAST SQUAR M		SQRMLT
F OUTPUT TAPE A MACHINE LANGUAGE INTEGER VECTOR SPRINT OR WRIT F		PWMLT
COLUMNS WITH INCREASING 3-DIGIT INTEGERS SLABEL PRINTER F		COLABL
OUT HOLLERITH VECTOR AS FORTRAN INTEGERS \$SPREAD M		HVT0IV
ME \$OUTPUT A MATRIX AS INTEGERS DENSELY PACKED OFF-LI F		MOUTA5
CONVERT FLTG. VECTOR TO MACHINE INTEGERS OR CONVERSELY \$SCALE, M		FXDATA
S FOR LONG SERIES OF FIXED POINT INTEGERS \$FAST CORRELATION M		PROCOR
XCESSIVE VALUES \$SCALE VECTOR TO INTEGERS FOR SCOPE, CLIPPING E M		SCPSCL
SSHUFFLE A LIST OF INTEGERS FPOM 1 TO N F		SHUFFL
\$INVERSION OF TPAEZOIDAL INTEGRAL M		IINTGR
SINDEFINITE INTEGRAL BY TRAPEZOIDAL RULE M		INTGRA
OIDAL INTEGRAL OR ABSOLUTE VALUE INTEGRAL \$MOVING TRAPEZ M		MVNTIN

CALE OR SCALE VECTOR FOR SIMPSON INTEGRAL AND/OR INTEGRATE SUNS	F	SIMPSON
MITUDE \$DEFINITE TRAPEZOIDAL INTEGRAL OF FUNCTION OR ITS MA	M	TINGL
TEGRAL \$MOVING TRAPEZOIDAL INTEGRAL OR ABSOLUTE VALUE INT	M	MVNTIN
CTOR FOR SIMPSON INTEGRAL AND/OR INTEGRATE SUNSCALE OR SCALE VE	F	SIMPSON
TING OF FIXED VECTOR \$INTEGRATED SUMMATION OF A FLOA	M	INTSUM
X COLUMN WITH ARBITRARY INDEX BY INTERPOLATION \$FIND A Matri	M	ARBCOL
XPANSION OF A VECTOR UNDER CUBIC INTERPOLATION SHI-SPEED E	M	EXPAND
OF A MONOTONE FUNCTION BY LINEAR INTERPOLATION \$INVERSION	M	IFNCTN
\$LINEAR INTERPOLATION IN A TABLE	F	LINTR1
0 4 EVENLY SPACED DATA VALUES \$INTERPOLATION OPERATOR FOR 1 T	M	INTOPR
SQUADRATIC INTERPOLATION IN A TABLE	F	QINTR1
SINTERPRET HOLLERITH	M	INTHOL
IME TIMING IN SECONDS USING 7090 INTERVAL CLOCK \$FOR REAL T	M	7090CLOCK1
-LINE REQUEST IF NOT \$CHECK IF INTERVAL TIMER IS ON MAKING ON	F	CLKON
SINVERSE OF A MATRIX	F	MATINV
INTO ITS EVEN AND ODD PARTS (OR INVERSE) SSPLIT A VECTOR	M	SPLIT
ARBITRARY TIME ORIGIN \$QUICK INVERSE FOURIER TRANSFORM WITH	F	QIFURY
ON BY LINEAR INTERPOLATION SINVERSION OF A MONOTONE FUNCTI	M	IFNCTN
Y DIFFERENCING SINVERSION OF DIFFERENTIATION B	M	IDERIV
RAL SINVERSION OF TRAPEZOIDAL INTEG	M	IINTGR
LEAST SQUARES SHAPER BY SIDEWAYS ITERATION S	F	LSSS1
\$MULTI-INPUT SIDEWARDS ITERATION	F	MISS
REASING 3-DIGIT INTEGERS \$LABEL PRINTER COLUMNS WITH INC	F	COLABL
OF TRANSIENTS BEGINNING WITH ANY LAG SCROSSCORRELATION	F	CROST
F TRANSIENTS BEGINNING WITH ZERO LAG SCROSSCORRELATION O	F	CROSS
\$FLOAT ANY MACHINE LANGUAGE INTEGER	M	FLOATM
HOLLERITH \$CONVERT MACHINE LANGUAGE INTEGER TO EQUIVALENT	M	ML12A6
AST SQUARE ELEMENTS OF A MACHINE LANGUAGE INTEGER VECTOR SF	M	SQRMLI
T OR WRITE OUTPUT TAPE A MACHINE LANGUAGE INTEGER VECTOR SPRIN	F	PWMLIV
\$MULTI-INPUT FILTER BY LEAST SQUARES	F	MIFLS
\$MULTI-INPUT PREDICTOR BY LEAST SQUARES	F	MIPLS
SLEAST SQUARES LINE	F	LSLINE
YS ITERATION SLEAST SQUARES SHAPER BY SIDEWA	F	LSSS1
REDICTOR SWIENER-LEVINSON LF'ST SQUARE ERROR FILTER OR P	F	WLLSFP
URSION, 1-DIMENSION \$REALIZABLE LEAST SQUARES PREDICTOR BY REC	F	RLSPR
URSION, 2-DIMENSIONS \$REALIZABLE LEAST SQUARES PREDICTOR BY REC	F	RLSPR2
ION \$REALIZABLE LEAST SQUARES SHAPER BY RECURS	F	RLSSR
CTION SHOLLERITH LEFT ADJUST OR RIGHT ADJUST FU	M	HLADJ
SSHIFT VECTOR ELEMENTS LOGICALLY LEFT OR RIGHT	M	SHFTR2
T VECTOR ELEMENTS ARITHMETICALLY LEFT OR RIGHT SSHIF	M	SHFTR1
STRIANGULAR AVERAGING, MOVING LEFT OR RIGHT END	M	TAMVL
BLOCK OF VALUES ALL ABOVE GIVEN LEVELSSCAN VECTOR FOR POSSIBLE	F	NXALRM
ATA SFIND CONTOUR LEVELS FOR PLOTTING A ROW OF D	F	CNTROW
LTER OR PREDICTOR SWIENER-LEVINSON LEAST SQUARE ERROR FI	F	WLLSFP
SFAST AUTOCORRELATIONS FOR LONG, LIMITED ACCURACY SERIES	F	QACORR
SFAST CONVOLUTIONS FOR LONG, LIMITED ACCURACY SERIES	F	QCNVLV
AST CROSS-CORRELATIONS FOR LONG, LIMITED ACCURACY SERIES	F	QXCORR
IND IF ARGUMENT FALLS INSIDE TWO LIMITING VALUES SF	M	XLIMIT
BLES FROM LIST FALL WITHIN GIVEN LIMITS SCHECK THAT VARIA	M	LIMITS
SLEAST SQUARES LINE	F	LSLIE

X AS INTEGERS DENSELY PACKED OFF-LINE	\$OUTPUT A MATRIX	F	MOUTAI
\$OUTPUT VARIABLES FIVE PER LINE IN G FORMAT		M	CSOUT
\$PLOT FAST HORIZONTAL LINE ON SCOPE		M	7090LINEH
\$PLOT FAST HORIZONTAL LINE ON SCOPE		M	709LINEH
\$PLOT FAST VERTICAL LINE ON SCOPE		M	7090LINEV
\$PLOT FAST VERTICAL LINE ON SCOPE		M	709LINEV
PROGRAM AND COMMON	\$OFF-LINE PRINT OF MEMORY USAGE - P	F	MEMUSE
SCONTOUR OF MATRIX SUBSET ON OFF-LINE PRINTER		F	CONTUR
F INTERVAL TIMER IS ON MAKING ON-LINE REQUEST IF NOT	\$CHECK I	F	CLKCN
\$FAST ARBITRARY STRAIGHT LINE SEGMENT ON SCOPE		M	7090LINE
\$FAST ARBITRARY STRAIGHT LINE SEGMENT ON SCOPE		M	709LINE
ERSION OF A MONOTONE FUNCTION BY LINEAR INTERPOLATION	\$INV	M	IFNCTN
E	\$LINEAR INTERPOLATION IN A TABL	F	LINTR1
ET FXD OR FLTG VECTOR EQUAL TO A LINEAR SEGMENT	\$ S M	M	SETLIN
LCAT+NG	\$SET LINEAR VECTORS, FIXED AND/OR F	M	SETLNS
SSPACE CARRIAGE N LINES OR RESTORE PAGE		F	CARIGE
AN INDATA-ODATA TYPE TAPE	\$LIST AUXILIARY INFORMATION FOR	F	LISTING
TAPE TO FRONT OF DECK	\$LIST DATA DECK AND REPOSITION	F	DADECK
S CHECK THAT VARIABLES FROM LIST FALL WITHIN GIVEN LIMITS		M	LIMITS
O SETS OF VALUES	\$SET A LIST OF VARIABLES TO ONE OF TW	M	CHOOSE
HINE ADDRESSES OF VARIABLES IN A LIST	\$CREATE VECTOR OF MAC	M	XLOCV
SS.HUFFLE A LIST OF INTEGERS FROM 1 TO N		F	SHUFFL
\$\$SET A LIST OF VECTORS TO ZERO		M	STZS
WRITE OUTPUT TAPE WITH NORMAL OR LITERAL FORMAT VECTOR	\$ F	F	FMTOUT
TPUT COLUMN VECTORS BY NORMAL OR LITERAL FORMATS	\$OU M	M	CVSOUT
SACCESS TO LITERAL OR ORDINARY FORMAT		M	FNDfmt
INF VECTOR OUTPUT WITH NORMAL OR LITERAL FORMAT	\$OFFL F	F	VECOUT
\$OUTPUT VARIABLES BY NORMAL OR LITERAL FORMAT		M	VRSOUT
OUTPUT NAMED VECTOR BY NORMAL OR LITERAL FORMAT WITH SPACING	\$ F	F	VOUT
UTPUT NAMED VECTORS BY NORMAL OR LITERAL FORMATS WITH SPACING\$O		M	VSOUT
BY PROXY CALL STATEMENTS	\$LOCATE AND OPERATE SUBROUTINES	M	LOCATE
C COMMON	\$LOCATE ARGUMENT WITH RESPECT T	F	IXCARG
\$MOVE A VECTOR TO A DIFFERENT LOCATION		M	MOVE
NT	\$STORE LOCATION WITH INDEXABLE ARGUME	M	LOC
	\$LOGICAL SHIFT FUNCTION	M	LSHFT
	\$COMPUTE A LOGICAL SUMCHFCK	M	FAPSUM
LS	\$SHIFT VECTOR ELEMENTS LOGICALLY LEFT OR RIGHT	M	SHFTR2
	\$PERFORM LONG DIVISION OF TWO POLYNOMIA	F	POLYDV
	\$SCALE, CONVERT FLTG. VECTOR TO MACHINE INTEGERS OR CONVERSELY	M	FXDATA
	\$FLOAT ANY MACHINE LANGUAGE INTEGER	M	FLOATM
UIVALENT HOLLERITH	\$CONVERT MACHINE LANGUAGE INTEGER TO EQ	M	MLI2A6
IN A LIST	\$CREATE VECTOR OF MACHINE ADDRESSES OF VARIABLES	M	XLOCV
OR ROUND FLOATING PT. NUMBER TO MACHINE INTEGER	\$TRUNCATE	M	XFIXM
R	\$FAST SQUARE ELEMENTS OF A MACHINE LANGUAGE INTEGER VECTO	M	SQRMLI
R	\$PRINT OR WRITE OUTPUT TAPE A MACHINE LANGUAGE INTEGER VECTO	F	PWMLIV
IDAL INTEGRAL OF FUNCTION OR ITS MAGNITUDE	\$DEFINITE TRAPEZO	M	TINGL
AN INTEGER SERIES	\$MAP A SEQUENCE OF NUMBERS INTO	M	MPSEQ1
RELATION OF TRANSIENT VECTORS OF MATRICES	\$CROSSCOR	F	CRSVM
VERSED DOT PRODUCT OF VECTORS OF MATRICES	\$DOT PRODUCT OR RE	F	MDOT3
VERSFD DOT PRODUCT OF VECTORS OF MATRICES	\$DOT PRODUCT OR RF	F	MDOT

	\$REVERSE VECTOR OF MATRICES OR A SYMMETRIC POSITIVE DEFINITE MATRIX	\$FACT	F	MVRVS MFACT
	SINVERSE OF A MATRIX		F	MATINV
KED OFF-LINE ICATION	\$OUTPUT A MATRIX AS INTEGERS DENSELY PAC \$N X M MATRIX BY M X L MATRIX MULTIPL		F	MOUTAI MATML3
NDEX BY INTERPOLATION	\$FIND A MATRIX COLUMN WITH ARBITRARY I M		F	ARBCOL
	SEXTRIMAL VALUES OF MATRIX ELEMENTS		M	MAXSNM
	\$N X M MATRIX BY M X L MATRIX MULTIPLICATION		F	MATML3
	SSQUARE MATRIX MULTIPLICATION		M	MATML1
ELS	\$CONTOUR A MATRIX ON THE PRINTER IN DECIB		F	CNTRDB
	\$MATRIX OUTPUT IN G FORMAT		F	MOUT
TER	\$CONTOUR OF MATRIX SUBSET ON OFF-LINE PRIN		F	CONTUR
	\$MATRIX TRANSPOSE		M	MATRA
	SSQUARE MATRIX TRANSPOSE		M	MATRA1
TION FUNCTIONS	\$REGION TO MAXIMIZE RATIO OF TWO DISTRIBUTU		F	MXRARE
	\$NORMALIZE A VECTOR TO GIVEN MAXIMUM VALUE		M	NMZMG1
PENDENCY FROM PROBABILITY DENSIT	\$MEAN SQUARE CONTINGENCY AND DE		F	MSCON1
	\$REMOVE THE MEAN FROM A FIXED VECTOR		M	XREMAV
	\$REMOVE THE MEAN FROM A FLOATING VECTOR		M	REMAV
	\$NORMALIZE AND CHANGE MEAN OF A VECTOR		F	NRMVEC
R	\$MOVING MEAN SQUARE AVERAGE OF A VECTO		F	MVSQAV
MON	\$OFF-LINE PRINT OF MEMORY USAGE - PROGRAM AND COM		F	MEMUSE
SE ODD-LENGTHED VECTOR ABOUT ITS MIDPOINT	\$COLLAP	M	KOLAPS	
E \$ACCESS ROUTINE FOR RAND CORP. MILLION RANDOM DIGITS FROM TAP		F	GETRD1	
	\$FACTOR POWER SPECTRUM TO FIND MINIMUM PHASE WAVELET		M	FACTOR
	SENABLE MIXED EXPRESSIONS IN FORTRAN		M	SAME
ONVERT FORTRAN INTEGER VECTOR TO MLI VECTOR	\$FAST C	M	ITOMLI	
POINT INTEGER	\$MULTIPLY AN MLI VECTOR BY A FORTRAN FIXED	M	MLISCL	
	SQUICK CROSSCORRELATION OF MLI TRANSIENTS		F	QXCOR1
	\$FAST COMPARE TWO ARBITRARY MODE VECTORS FOR IDENTITY		M	CMPARV
VECTOR EQUAL TO A CONSTANT (ANY MODE)	\$SET ALL ELEMENTS OF	M	SETKV	
CONSTANT OR BY CONSTANTS	\$MODIFY A SET OF VARIABLES BY A	M	ADDK	
IONS FOR DANIELL SPECTRA	\$MODIFY AUTO- OR CROSS-CORRELAT	M	ADANL	
LITY DISTRIBUTION WITH SPECIFIED MOMENTS	\$GENERATE PROBAB	F	PRBFIT	
\$REREAD DATA RECORD AND END FILE MONITOR		M	REREAD	
	SOPTIONAL ONLINE MONITOR OF BCD TAPE WRITING		M	ONLINE
ING BEHAVIOR	\$CHECK VECTOR FOR MOMOTONE INCREAS	M	MONOCK	
TERPOLATION	SINVERSION OF A MONOTONE FUNCTION BY LINEAR IN	M	IFNCTN	
OCATION	\$MOVE A VECTOR TO A DIFFERENT L	M	MOVE	
RS	\$MOVE AN ARBITRARY SET OF VECTO	M	MOVECS	
OR CHANGE SIGN OF A VECTOR	\$MOVE, REVERSE, CHANGE SPACING,	M	MOVREV	
	\$MOVE DATA BLOCK	M	MVBLOK	
	\$MOVING AVERAGE OF A VECTOR	F	MVINAV	
A VECTOR	STRIANGULAR AVERAGING, MOVING LEFT OR RIGHT END	M	TAMVL	
INT VECTOR	\$MOVING MEAN SQUARE AVERAGE OF	F	MVSQAV	
BY A CONSTANT	\$FAST MOVING SUMMATION OF A FIXED PO	M	MUVADD	
ABSOLUTE VALUE INTEGRAL	\$MOVING SUMMATION WITH DIVISION	M	MVNSUM	
UARES	\$MOVING TRAPEZOIDAL INTEGRAL OR	M	MVNTIN	
SQUARES	\$MULTI-INPUT FILTER BY LEAST SQ	F	MIFLS	
	\$MULTI-INPUT PREDICTOR BY LEAST F	F	MIPLS	

N	\$MULTI-INPUT SIDEWARDS ITERATION	F	MISS
	SN X M MATRIX BY M X L MATRIX MULTIPLICATION	F	MATML3
	\$SQUARE MATRIX MULTIPLICATION	M	HATML1
RTRAN	FIXED POINT INTEGER	SMULTIPLY AN MLI VECTOR BY A FO	M
BY A SINGLE FLTG. PT. CONSTANT	SMULTIPLY ANY NO. OF VARIABLES	F	MLISCL
RS	FIXED OR FLOATING	SMULTIPLY ELEMENTS OF TWO VECTO	M
FIXED CONSTANT	SMULTIPLY VECTOR BY FLOATING OR	M	MULK -II
ON	INTO EQUALLY LIKELY SECTIONS	SNORMAL DISTRIBUTION AND DIVISI	M
XIMUM VALUE	SNORMALIZE A VECTOR TO GIVEN MA	M	NOINT1
VECTOR	SNORMALIZE AND CHANGE MEAN OF A	F	NMZMG1
N	GIVEN RANGE\$FREQUENCY COUNT OF NUMBER OF VALUES OF A SERIES	I	FREQCT2
LAST TERM	SEARCH VECTOR FOR NUMBER, STARTING FROM FIRST OR	F	SRCH1
\$TRUNCATE	OR ROUND FLOATING PT. NUMBER TO MACHINE INTEGER	M	XFI XM
\$MAP	A SEQUENCE OF NUMBERS INTO AN INTEGER SERIES	M	MPSEQ1
FR	FORTRAN-II INTEGER IS EVEN OR ODD	\$DETERMINE WHETHER	M
SPLIT	A VECTOR INTO ITS EVEN AND ODD PARTS (OR INVERSE)	\$	M
COSINE	AND/OR SINE TRANSFORMS OF ODD-LENGTH SERIES	SFAST	F
MIDPOINT	SCOLLAPSE ODD-LENGTHED VECTOR ABOUT ITS	M	COSTSI
SINE	TRANSFORMS FROM 2 OR 4 EVEN-ODD PARTS	SFAST COSINE AND/OR	M
MAL	MAL OR LITERAL FORMAT	SOFFLINE VECTOR OUTPUT WITH NOR	F
ATRIX	ATRIX AS INTEGERS DENSELY PACKED OFF-LINE	\$OUTPUT A M	F
- PROGRAM AND COMMON	- PROGRAM AND COMMON	SOFF-LINE PRINT OF MEMORY USAGE	F
	\$CONTOUR OF MATRIX SUBSET ON OFF-LINE PRINTER	F	MEMUSE
	SFAST COSINE TRANSFORMS OF ONE-SIDED AUTOCORRELATIONS	M	CONTUR
RANGE	SCOLLAPSE ONE-SIDED VECTOR INTO SMALLER	M	ASPECT
TING	OPTIONAL ONLINE MONITOR OF BCD TAPE WRI	M	COLAPS
ALL STATEMENTS	SLOCATE AND OPERATE SUBROUTINES BY PROXY	C	ONLINE
CDF DATA VALUES	\$INTERPOLATION OPERATOR FOR 1 TO 4 EVENLY SPA	M	LOCATE
ONE SUBROUTINE REPEATEDLY	OPERATE SEVERAL SUBROUTINES OR	M	INTOPR
TNE TO GIVEN ACCURACY	SFIND OPERATION TIME OF NEXT SUBROUT	M	SEVRAL
	SFAST REVERSE STORAGE ORDER OF A VECTOR	M	TIMSUB
OPE	SROUTINE DISPLAY \$VARIABLE ORIGIN FORMAT GENERATOR FOR SC	M	REVERS
FR	TRANSFORM WITH ARBITRARY TIME ORIGIN	SQUICK INVERSE FOURI	F
OF	TRANSIENT WITH ARBITRARY TIME ORIGIN\$FAST FOURIER TRANSFORM	F	DSPFMT
ILIARY	INFORMATION FOR AN INDATA-OUTDATA TYPE TAPE	SLIST AUX	QIFURY
TIALIZED	IALIZED FOR ADDING TO AN INDATA-OUTDATA TAPE	SINI	QFURRY
	STERMINATE AN INDATA-OUTDATA TAPE	F	LISTING
NSELY PACKED OFF-LINE	\$OUTPUT A MATRIX AS INTEGERS DE	F	SETINO
L OR LITERAL FORMATS	\$OUTPUT COLUMN VECTORS BY NORMA	M	TRMINO
	SMATRIX OUTPUT IN G FORMAT	F	MOUTAI
FRAL	FORMAT VECTOR	\$WRITE OUTPUT TAPE WITH NORMAL OR LIT	F
IN G FORMAT		\$OUTPUT VARIABLES FIVE PER LINE	M
OR LITERAL FORMAT WITH SPACING		\$OUTPUT NAMED VECTOR BY NORMAL	F
OR LITERAL FORMATS WITH SPACING\$OUTPUT		NAMED VECTOPS BY NORMAL	M
FORMAT OF A SUCCEEDING INPUT OR OUTPUT STATEMENT	SREPLACE THE	M	
INTEGER VECTOR	SPRINT OR WRITE OUTPUT TAPE A MACHINE LANGUAGE	F	
LITERAL FORMAT	\$OUTPUT VARIABLES BY NORMAL OR	M	
FORMAT	SOFFLINE VECTOR OUTPUT WITH NORMAL OR LITERAL	F	
AS HOLLERITH VECTOR	SPACK UP FORTRAN INTEGER VECTOR	M	
R	SSCALE AND FIX DATA VECTOR, PACK N DATA POINTS PER REGISTE	M	
	PAKN		

PUT A MATRIX AS INTEGERS DENSELY PACKED OFF-LINE	\$OUT	F	MOUTAI
SUNPACK AND RESCALE A PACKED DATA VECTOR		M	UNPAKN
PAGE CARRIAGE N LINES OR RESTORE PAGE	\$S	F	CARIGE
D OR FLOATING VECTOR ELEMENTS IN PAIRS	\$DIFFERENCE	FIXE M	DIFPRS
VARIABLES FOR EQUALITY \$COMPARE PAIRS OF VARIABLES OR A SET OF M			CMPARP
TRANSFORMS FROM 2 OR 4 EVEN-ODD PARTS \$FAST COSINE AND/OR SINE M			COSP
T A VECTOR INTO ITS EVEN AND ODD PARTS (OR INVERSE)	\$SPLIT	M	SPLIT
OR REVERSE	\$AMPLITUDE AND PHASE FROM REAL AND IMAGINARY, M		AMPHZ
R POWER SPECTRUM TO FIND MINIMUM PHASE WAVELET	\$FACTO	M	FACTOR
COPE	\$PLOT FAST HORIZONTAL LINE ON S M	7090LINEH	
COPE	\$PLOT FAST HORIZONTAL LINE ON S M	709LINEH	
PE	\$PLOT FAST VERTICAL LINE ON SCO M	7090LINEV	
PE	\$PLOT FAST VERTICAL LINE ON SCO M	709LINEV	
VECTORS	\$SPRINTER PLOT OF A SET OF EQUAL LENGTH F		PLTVS1
RS	\$SPRINTER-PLOT OF ARBITRARY SET OF VECTO F		PLOTVS
SMULTIPLE FRAME SCOPE PLOTS OF VECTOR SETS		F	GRAPH
SFIND CONTOUR LEVELS FOR PLOTTING A ROW OF DATA		F	CNTROW
SBAR GRAPH PLOTTING FOR SUBROUTINE GRAPH		M	HSTPLT-II
SCUBIC CURVE SCOPE PLOTTING FOR SUBROUTINE GRAPH		M	HSTPLT-III
SCUBIC CURVE SCOPE PLOTTING FOR SUBROUTINE GRAPH		M	HSTPLT-III
SHISTOGRAM PLOTTING FOR SUBROUTINE GRAPH		M	HSTPLT
S SETK AND SETVEC	\$PLURALIZE THE NEXT SUBROUTINE M		PLURNS
CH EXACTLY FITS 3 EQUALLY SPACED POINTS	\$PLURALIZED FORMS OF SUBROUTINE M		SETKP
AND FIX DATA VECTOR, PACK N DATA POINTS FOR REGISTER	\$FIND QUADRATIC WHI M		QUFIT1
ER SEQUENCE IN GROUPS OF FIVE AS POKER HAND\$EVALUATION OF INTEG F	\$SCALE M		PAKN
HE POWER SERIES SQUARE ROOT OF A POLYNOMIAL	\$COMPLEX POLYNOMIAL EVALUATION	F	POKCT1
AND COMPLEX ROOTS	\$FIND T F		IPLYEV
S REAL AND COMPLEX ROOTS	\$POLYNOMIAL ROOT FINDER	F	PSQRT
NTS FOR REAL ARGUMENT\$EVALUATE A POLYNOMIAL WITH REAL COEFFicie F	\$POLYNOMIAL SYNTHESIS FROM REAL F		MULLER
S PERFORM LONG DIVISION OF TWO POLYNOMIALS	\$POLYNOMIAL SYNTHESIZED FROM IT F		POLYSN
SFACTOR A SYMMETRIC POSITIVE DEFINITE MATRIX		F	POLYEV
PHASE WAVELET	\$FACTOR POWER SPECTRUM TO FIND MINIMUM M		POLYDV
SRAISE VECTOR TO POWER OR SUM POWER OF DEVIATIONS FROM BASE M			MFAC
NS FROM BASE	SRAISE VECTOR TO POWER OR SUM POWER OF DEVIATIO M		FACTOR
POLYNOMIAL	\$FIND THE POWER SERIES SQUARE ROOT OF A F		POWER
	\$MULTI-INPUT PREDICTOR BY LEAST SQUARES F		POWER
SON LEAST SQUARE ERROR FILTER OR PREDICTOR	\$WIENER-LEVIN F		PSQRT
NSION SREALIZABLE LEAST SQUARES PREDICTOR BY RECURSION, 1-DIME F			MIPLS
NSIONS SREALIZABLE LEAST SQUARES PREDICTOR BY RECURSION, 2-DIME F			WLLSFP
M AND COMMON	\$OFF-LINE PRINT OF MEMORY USAGE - PROGRA F		RLSPR
ACHINE LANGUAGE INTEGER VECTOR \$PRINT OR WRITE OUTPUT TAPE A M F			RLSPR2
OUR OF MATRIX SUBSET ON OFF-LINE PRINTER	\$CONT F		MEMUSE
G 3-DIGIT INTEGERS	SLABEL PRINTER COLUMNS WITH INCREASIN F		PWMLIV
LENGTH VECTORS	\$CONTOUR A MATRIX ON THE PRINTER IN DECIBELS F		CONTUR
OF VECTORS	\$SPRINTER PLOT OF A SET OF EQUAL F		COLABL
	\$SPRINTER-PLOT OF ARBITRARY SET F		CNTRDB
			PLTVS1
			PLOTVS
			CHISQR

CONTINGENCY AND DEPENDENCY FROM PROBABILITY DENSITY \$MEAN SQUARE F  
 VARIATE EXCEEDS A VALUE \$PROBABILITY THAT A CHI-SQUARED F  
 SERIES AT GIVEN LAG \$SECOND PROBABILITY DENSITY OF INTEGER F  
 SPECIFIED MOMENTS \$GENERATE PROBABILITY DISTRIBUTION WITH F  
 \$DIVIDE THE X AXIS INTO EQUALLY PROBABLE RANGES F  
 S \$DISPLACED DOT PRODUCT OF 2-DIMENSIONAL ARRAY F  
 \$FAST DOT PRODUCT OF TWO VECTORS M  
 \$DOT PRODUCT OR REVERSED DOT PRODUCT OF VECTORS OF MATRICES F  
 \$DOT PRODUCT OR REVERSED DOT PRODUCT OF VECTORS OF MATRICES F  
 T OF VECTORS OF MATRICES \$DOT PRODUCT OR REVERSED DOT PRODUCT F  
 T OF VECTORS OF MATRICES \$DOT PRODUCT OR REVERSED DOT PRODUCT F  
 NTS \$VECTOR DOT PRODUCT WITH ARBITRARY INCREME M  
 VISION BY CONSTANT \$DOT PRODUCT OF TWO VECTORS WITH DI M  
 OCATE AND OPERATE SUBROUTINES BY PROXY CALL STATEMENTS \$L M  
 ABLE \$SQUAREATIC INTERPOLATION IN A T F  
 EQUALLY SPACED POINTS \$FIND QUADRATIC WHICH EXACTLY FITS 3 M  
 TRANSIENTS \$QUICK CROSSCORRELATION OF M I F  
 M WITH ARBITRARY TIME ORIGIN \$QUICK INVERSE FOURIER TRANSFOR F  
 OWER OF DEVIATIONS FROM BASE \$RAISE VECTOR TO POWER OR SUM P M  
 TS FROM TAPE \$ACCESS ROUTINE FOR RAND CORP. MILLION RANDOM DIGI F  
 S ROUTINE FOR RAND CORP. MILLION RANDOM DIGITS FROM TAPE \$ACCES F  
 SE ONE-SIDED VECTOR INTO SMALLER RANGE \$COLLAP M  
 R OF VALUES OF A SERIES IN GIVEN RANGES \$FREQUENCY COUNT OF NUMBE M  
 IFIED ACCURACY, OF GIVEN PROGRAM RANGE \$REAL TIME, TO SPEC M 709TIMA2B  
 ONE VECTOR FROM ANOTHER WITH NEW RANGE AND INCREMENT \$CREATE M  
 THE X AXIS INTO EQUALLY PROBABLE RANGES \$DIVIDE F  
 TIONS \$REGION TO MAXIMIZE RATIO OF TWO DISTRIBUTION FUNC F  
 T \$READ DATA IN GENERALIZED FORMA F  
 RY TAPE \$READ EVERY N-TH WORD FROM BINA N  
 SAMPLITUDE AND PHASE FROM REAL AND IMAGINARY, OR REVERSE M  
 ING 7090 INTERVAL CLOCK \$FOR REAL TIME TIMING IN SECONDS US M 7090CLOCK1  
 \$POLYNOMIAL SYNTHESIS FROM REAL AND COMPLEX ROOTS F  
 \$POLYNOMIAL SYNTHESIZED FROM ITS REAL AND COMPLEX ROOTS F  
 OMIAL WITH REAL COEFFICIENTS FOR REAL ARGUMENT\$EVALUATE A POLYN F  
 UMENT\$EVALUATE A POLYNOMIAL WITH REAL COEFFICIENTS FOR REAL ARG F  
 CY, OF GIVEN PROGRAM RANGE \$REAL TIME, TO SPECIFIED ACCURA M 709TIMA2B  
 CTOR BY RECURSION, 2-DIMENSIONS \$REALIZABLE LEAST SQUARES PREDI F  
 CTOR BY RECURSION, 1-DIMENSION \$REALIZABLE LEAST SQUARES PREDI F  
 R BY RECURSION \$REALIZABLE LEAST SQUARES SHAPE F  
 SREAD DATA RECORD AND END FILE MONITOR M  
 SITION TAPE \$TEST IF NEXT TAPE RECORD IS END OF FILE AND REPO M  
 \$SKIP FORWARD OR BACKWARD OVER RECORDS ON TAPE M  
 \$TWO-DIMENSIONAL FILTER BY RECURSION F  
 ALIZABLE LEAST SQUARES SHAPER BY RECURSION SRE F  
 ZABLE LEAST SQUARES PREDICTOR BY RECURSION, 1-DIMENSION \$REALI F  
 ZABLE LEAST SQUARES PREDICTOR BY RECURSION, 2-DIMENSIONS \$REALI F  
 CTOR THROUGH A CONSTANT \$REFLECT A FIXED OR FLOATING VE M  
 O DISTRIBUTION FUNCTIONS \$REGION TO MAXIMIZE RATIO OF TW F  
 A VECTOR, PACK N DATA POINTS PER REGISTER \$SCALE AND FIX DAT M  
 ECTOR \$REMOVE THE MEAN FROM A FIXED V M  
 MSCON1  
 KIINT1  
 PROB2  
 PRBFIT  
 GRUP2  
 DOTP  
 FDOT  
 MDOT3  
 MDOT  
 MDOT3  
 MDOT  
 DOTJ  
 VDOTV  
 LOCATE  
 QINTR1  
 QUFIT1  
 QXCOR1  
 QIFURY  
 POWER  
 GETRD1  
 GETRD1  
 COLAPS  
 FRQCT2  
 709TIMA2B  
 NURINC  
 GRUP2  
 MXRARE  
 RDATA  
 PACDAT  
 AMPHZ  
 7090CLOCK1  
 POLYSN  
 PLYSYN  
 POLYEV  
 POLYEV  
 709TIMA2B  
 RLSPR2  
 RLSPR  
 RLSSR  
 REREAD  
 ZEFBCD  
 RSKIP  
 FIRE2  
 RLSSR  
 RLSPR  
 RLSPR2  
 REFLEC  
 MXRARE  
 PAKN  
 XREMAV

G VECTOR	\$REMOVE THE MEAN FROM A FLOATIN M	REMAV
DING INPUT OR OUTPUT STATEMENT	\$REPLACE THE FORMAT OF A SUCCE M	RPLFMT
CK	\$LIST DATA DECK AND REPOSITION TAPE TO FRONT OF DE F	DADECK
T TAPE RECORD IS END OF FILE AND REPOSITION TAPE	\$TEST IF NEX M	ZEFBCD
E MONITOR	\$REREAD DATA RECORD AND END FIL M	REREAD
ERVAL TIMER IS ON MAKING ON-LINE REQUEST IF NOT	\$CHECK IF INT F	CLKON
ICAL FILTER WITH GIVEN AMPLITUDE RESPONSE	\$UNPACK AND RESCALE A PACKED DATA VECTOR M	UNPAKN
\$SPACE CARRIAGE N LINES OR RESTORE PAGE	\$GENERATE SYMMTR F	GNFL[]
AL TAPE	\$FAST AND CONVENIENT RETRIEVAL OF DATA FROM A SPECI F	CARIGE
E FIRST	\$RETURN N-TH ARGUMENT BEYOND TH M	INDATA
S PRODUCED BY SPLIT.	\$FAST REVERSAL OF SPECIAL VECTORS ,A M	NTHA
HASE FROM REAL AND IMAGINARY, OR REVERSE	\$AMPLITUDE AND P M	CHPRTS
ANGE SIGN OF A VECTOR	\$MOVE,REVERSE, CHANGE SPACING, OR CH M	AMPHZ
IN PLACE	\$REVERSE VFCTOR OF MATRICES F	MRVRS
TOR	\$REVERSE A VECTOR ELSEWHERE OR M	REVER
S OF MATRICES	\$DOT PRODUCT OR REVERSED DOT PRODUCT OF VECTOR F	MDOT3
S OF MATRICES	\$DOT PRODUCT OR REVERSED DOT PRODUCT OF VECTOR F	MDOT1
SHOLLERITH LEFT ADJUST OR RIGHT ADJUST FUNCTION	M	HLADJ
ELEMENTS ARITHMETICALLY LEFT OR RIGHT	\$SHIFT VECTOR M	SHFTR1
VFCTOR ELEMENTS LOGICALLY LEFT OR RIGHT	\$SHIFT V M	SHFTR2
NGULAR AVERAGING, MOVING LEFT OR RIGHT END	\$TRIA M	TAMVL
SE OR FROM TRUE AVERAGE	\$R.M.S. DEVIATION FROM GIVEN BA M	RMSDEV
\$POLYNOMIAL ROOT FINDER	F	MULLER
UNDING	\$SQUARE ROOT OF A FIXED VECTOR WITH PO M	XSQRT
\$SQUARE ROOT OF A FLOATING VECTOR	M	SQROOT
\$FIND THE POWER SERIES SQUARE ROOT OF A POLYNOMIAL	F	PSORT
SYNTHESIS FROM REAL AND COMPLEX ROOTS	\$POLYNOMIAL F	POLYSN
FSIZED FROM ITS REAL AND COMPLEX ROOTS	\$POLYNOMIAL SYNTH F	PLYSYN
NWARDS AN ARBITRARY AMOUNT	\$ROTATE A VECTOR UPWARDS OR DOW M	ROTAT1
ISYMMETRIC 2-DIMENSIONAL ARRAY	\$ROTATE CENTRO-SYMMETRIC OR ANT F	ROAR2
\$ROUND, ROUND UP, OR ROUND DOWN A FLOATING VECTOR	M	RNDV
ACHINE INTEGER	\$TRUNCATE OR ROUND FLOATING PT. NUMBER TO M M	XFIXM
OR TO NEAREST FLTG. PT. INTEGER	\$ROUND FLTG. PT. NO. UP, DOWN, M	RND
A FLOATING VECTOR	\$ROUND, ROUND UP, OR ROUND DOWN M	RNDV
TING VECTOR	\$ROUND, ROUND UP, OR ROUND DOWN A FLOA M	RNDV
FLOATING VECTOR WITH OR WITHOUT ROUNDING	SFIX A M	FIXV
WO FIXED VECTORS WITH OR WITHOUT ROUNDING	\$DIVIDE ELEMENTS OF T M	XDVVBV
UARE ROOT OF A FIXED VECTOR WITH ROUNDING	SSQ M	XSORUT
FXD PT DIVIDE WITH TRUNCATION OR ROUNDING TO FORTRAN-II INTEGES M	XDIV	CNTROW
ND CONTOUR LEVELS FOR PLOTTING A ROW OF DATA	\$FI F	INTGRA
DEFINITE INTEGRAL BY TRAPEZOIDAL RULE	SIN M	FXDATA
MACHINE INTEGERS OR CCVERSEL \$SCALE, CONVERT FLTG. VECTOR TO M	PAKN	
K N DATA POINTS PER REGISTER	SSCALE AND FIX DATA VECTOR, PAC M	SIMPSON
RAL AND/OR INTEGRATE \$UNSCALE OR SCALE VECTOR FOR SIMPSON INTEG F	SCPSCL	
COPE, CLIPPING EXCESSIVE VALUES \$SCALE VECTOR TO INTEGERS FOR S M	FASCN1	
OR GREATER THAN GIVEN VALUES\$FAST SCAN VECTOR FOR ELEMENT EQUAL M	NXALRM	
OF VALUES ALL ABOVE GIVEN LEVEL\$SCAN VECTOR FOR POSSIBLE BLOCK F		
SADVANCE FILM FRAME ON SCOPE	M 7090FRAME	

SADVANCE FILM FRAME ON SCOPE		M	709FRAME
\$BITRARY STRAIGHT LINE SEGMENT ON SCOPE	\$FAST AR	M	709OLINE
\$BITRARY STRAIGHT LINE SEGMENT ON SCOPE	\$FAST AR	M	709LINE
\$PLOT FAST HORIZONTAL LINE ON SCOPE		M	709OLINEH
\$PLOT FAST HORIZONTAL LINE ON SCOPE		M	709LINEH
\$PLOT FAST VERTICAL LINE ON SCOPE		M	709OLINEV
\$PLOT FAST VERTICAL LINE ON SCOPE		M	709LINEV
\$WRITTE HOLLERITH TEXT ON SCOPE		M	709ODISPLA
\$WRITTE HOLLERITH TEXT ON SCOPE		M	709DISPLA
\$MULTIPLE FRAME SCOPE PLOTS OF VECTOR SETS		F	GRAPH
GRAPH \$CUBIC CURVE SCOPE PLOTTING FOR SUBROUTINE		M	HSTPLT-III
GRAPH \$CUBIC CURVE SCOPE PLOTTING FOR SUBROUTINE		M	HSTPLT-III
ABLE ORIGIN FORMAT GENERATOR FOR SCOPE SUBROUTINE	\$VARI	M	DSPFMT
ES \$SCALE VECTOR TO INTEGERS FOR SCOPE, CLIPPING EXCESSIVE VALU		M	SCPSCL
TING FROM FIRST OR LAST TERM	\$SEARCH A VECTOR FOR A VALUE	M	SEARCH
INTEGER SERIES AT GIVEN LAG	\$SEARCH VFCTOR FOR NUMBER, STAR	F	SRCH1
OCK FOR REAL TIME TIMING IN SECONDS USING 7090 INTERVAL CL	\$SECODN PROBABILITY DENSITY OF	F	PROB2
AND DIVISION INTO EQUALLY LIKELY SECTIONS	\$NORMAL DISTRIBUTION	M	NOINTI
\$FAST ARBITRARY STRAIGHT LINE SEGMENT ON SCOPE		M	709OLINE
\$FAST ARBITRARY STRAIGHT LINE SEGMENT ON SCOPE		M	709LINE
OR FLTG VECTOR EQUAL TO A LINEAR SEGMENT	\$ SET FXD	M	SETLIN
\$TEST THE CONDITION OF ANY SENSE SWITCH		M	SWITCH
\$GFT HOLLERITH DATA FROM CALLING SEQUENCE		F	GETHOL
TEGER SERIES	\$MAP A SEQUENCE OF NUMBERS INTO AN IN	M	MPSEQ1
POKER HAND\$EVALUATION OF INTEGER SEQUENCE IN GROUPS OF FIVE AS		F	POKCT1
FORTRAN VARIABLE LENGTH CALLING SEQUENCES	SENABLE	M	VARARG
\$FAST FUNCTIONS FOR SEQUENTIAL SINES AND COSINES		M	SEQSAC
OR SINE TRANSFORMS OF ODD-LENGTH SERIES	\$FAST COSINE AND/	F	COSIS1
UENCE OF NUMBERS INTO AN INTEGER SERIES	\$MAP A SEQ	M	MPSEQ1
Y COUNT OF NUMBER OF VALUES OF A SERIES IN GIVEN RANGE\$FREQUENC		M	FROCT2
TIONS FOR LONG, LIMITED ACCURACY SERIES	\$FAST AUTOCORRELAT	F	QACORR
TIONS FOR LONG, LIMITED ACCURACY SERIES	\$FAST CONVOLU	F	QCNVLV
TIONS FOR LONG, LIMITED ACCURACY SERIES	\$FAST CROSS-CORRELAT	F	QXCORR
N PROBABILITY DENSITY OF INTEGER SERIES AT GIVEN LAG	\$SECOD	F	PROB2
\$FAST CORRELATIONS FOR LONG SERIES OF FIXED POINT INTEGERS		M	PROCOR
MIAL \$FIND THE POWER SERIES SQUARE ROOT OF A POLYNOMIAL		F	PSQRT
OF TWO SETS OF VALUES	\$SET A LIST OF VARIABLES TO ONE	M	CHOOSE
OR BY CONSTANTS	\$MODIFY A SET OF VARIABLES BY A CONSTANT	M	ADDK
\$COMPARE PAIRS OF VARIABLES OR A SET OF VARIABLES FOR EQUALITY		M	CMPARP
SMOVE AN ARBITRARY SET OF VECTORS		M	MOVECS
AL TO A CONSTANT (ANY MODE)	\$SET A LIST OF VECTORS TO ZERO	M	STZS
TO SEPARATE VALUES (FXD OR FLTG)\$SET ANY NO. OF VARIABLES EQUAL		M	SETKV
TO A SINGLE VALUE (FXD OR FLTG)\$SET ANY NO. OF VARIABLES EQUAL		F	SETKS -II
O SEPARATE VALUES (FXD OR FLTG)\$SET ANY NO. OF VECTORS EQUAL		F	SETK -II
O A LINEAR SEGMENT	\$ SET FXD OR FLTG VECTOR EQUAL T	M	SETKVS
OR FLOAT+NG	\$SET LINEAR VECTORS, FIXED AND/	M	SETLIN
SPRINTER PLOT OF A SET OF EQUAL LENGTH VECTORS		F	SETLNS
SPRINTER-PLOT OF ARBITRARY SET OF VECTORS		F	PLTVS1
			PLOTVS

VEN VALUES	\$SET VARIABLES OR VECTORS TO GI	M	SETK
	\$FAST SET VECTOR TO ZERO	M	STZ
IPLE FRAME SCOPE PLOTS OF VECTOR SETS	\$MULT F		GRAPH
LIST OF VARIABLES TO ONE OF TWO SETS OF VALUES	\$SET A M		CHOOSE
SPLURALIZED FORMS OF SUBROUTINES SETK AND SETVEC	M		SETKP
ED FORMS OF SUBROUTINES SETK AND SETVEC	SPLURALIZ M		SETKP
S FOR INCREMENTING, TESTING, AND SETTING	SHYBRID SUBPROGRAM M		INDEX
SLEAST SQUARES SHAPER BY SIDEWAYS ITERATION	F		LSSS1
\$REALIZABLE LEAST SQUARES SHAPER BY RECURSION	F		RLSSR
	\$LOGICAL SHIFT FUNCTION	M	LSHFT
ICALLY LEFT OR RIGHT	\$SHIFT VECTOR ELEMENTS ARITHMET	M	SHFTR1
Y LEFT OR RIGHT	\$SHIFT VECTOR ELEMENTS LOGICALL	M	SHFTR2
M 1 TO N	\$SHUFFLE A LIST OF INTEGERS FRO	F	SHUFFL
	\$MULTI-INPUT SIDEWARDS ITERATION	F	MISS
ENTS	SLEAST SQUARES SHAPER BY SIDEWAYS ITERATION	F	LSSS1
	\$FORM A VECTOR BY SIFTING ANOTHER AT EVEN INCREM	M	SIFT
	\$CHANGE ALL SIGN BITS OF A VECTOR	M	CHSIGN
VERSE, CHANGE SPACING, OR CHANGE SIGN OF A VECTOR	\$MOVE,RE	M	MOVREV
VARIABLES OR 0 IF SAME INCLUDING SIGN	\$SIGN OF DIFFERENCE OF 2	M	XACTEQ
LES OR 0 IF SAME INCLUDING SIGN	\$SIGN OF DIFFERENCE OF 2	M	XACTEQ
LUES OF A VECTOR	\$FIND SIGNED OR UNSIGNED EXTREMAL VA	M	MAXSN
ATE \$UNSCALE OR SCALE VECTOR FOR SIMPSON INTEGRAL AND/OR INTEGR	F		SMPSON
EKRIMANT EVALUATION	\$SOLUTION OF SIMULTANEOUS EQUATIONS AND DET	M	SIMEQ
R FLOATING	\$GENERATE COSINE OR SINE HALF-WAVE TABLES, FIXED O	M	COSTBL
EN-ODD PARTS	\$FAST COSINE AND/OR SINE TRANSFORMS FROM 2 OR 4 EV	M	COSP
SERIES	\$FAST COSINE AND/OR SINE TRANSFORMS OF ODD-LENGTH	F	COSIS1
LATION FUNCTIONS	\$FAST COSINE, SINE TRANSFORMS OF CROSS-CORRE	F	XSPEC
	\$FAST FUNCTIONS FOR SEQUENTIAL SINES AND COSINES	M	SEQSAC
	\$FAST MAKE INDEX (BY INCREASING SIZE) OF ELEMENTS IN A VECTOR	M	SIZEUP
FILES ON TAPE	\$SKIP FORWARD OR BACKWARD OVER	M	FSKIP
RECORDS ON TAPE	\$SKIP FORWARD OR BACKWARD OVER	M	RSKIP
ORE PAGE	\$SPACE CARRIAGE N LINES OR REST	F	CARIGE
	\$FAST EVALUATE CUBIC FOR EVENLY SPACED ARGUMENTS	M	FASCUB
ATION OPERATOR FOR 1 TO 4 EVENLY SPACED DATA VALUES	\$INTERPOL	M	INTOPR
BIC WHICH EXACTLY FITS 4 EQUALLY SPACED POINTS	\$FIND CU	M	CUFIT1
ECTOR	\$MOVE,REVERSE, CHANGE SPACING, OR CHANGE SIGN OF A V	M	MOVREV
ROSSCORRELATION OF 2-DIMENSIONAL SPATIAL ARRAYS	\$SPATIAL C	F	SPCOR2
DIMENSIONAL SPATIAL ARRAYS	\$SPATIAL CROSSCORRELATION OF 2-	F	SPCOR2
	\$FAST TWO-DIMENSIONAL SPATIAL SPECTRUM	F	PLANSP
R CROSS-CORRELATIONS FOR DANIELL SPECTRA	\$MODIFY AUTO- O	M	ADANL
	\$HIGH SPEED 24 POINT SPECTRUM	F	FT24 -II
	\$HIGH SPEED 24 POINT SPECTRUM	M	FT24
WAVELET	SFACTOR POWER SPECTRUM TO FIND MINIMUM PHASE	M	FACTOR
	\$FAST TWO-DIMENSIONAL SPATIAL SPECTRUM	F	PLANSP
	\$HIGH SPEED 24 POINT SPECTRUM	F	FT24 -II
	\$HIGH SPEED 24 POINT SPECTRUM	M	FT24
DER CUBIC INTERPOLATION	SHI-SPEED EXPANSION OF A VECTOR UN	M	EXPAND
SPECIAL VECTORS ,AS PRODUCED BY SPLIT.	\$FAST REVERSAL OF	M	CHPRTS
ND ODD PARTS (OR INVERSE)	SSPLIT A VECTOR INTO ITS EVEN A	M	SPLIT
FORTRAN INTEGERS	SSPREAD OUT HOLLERITH VECTOR AS	M	HVTIOIV

NCY FROM PROBABILITY DENSIT	SMEAN SQUARE CONTINGENCY AND DEPEND	F	MSCON1
Y CASE	\$COMPUTE CHI-SQUARE FOR CONSTANT PROBABILIT	F	CHISQR
	\$SQUARE MATRIX MULTIPLICATION	M	MATML1
	\$SQUARE MATRIX TRANSPOSE	M	MATRA1
	\$MOVING MEAN SQUARE AVERAGE OF A VECTOR	F	MVSQAV
M ANOTHER OR FROM A CONSTANT	\$SUM SQUARE DIF. OF FLTG VECTOR FRO	M	SQRDFR
M ANOTHER OR FROM A CONSTANT	\$SUM SQUARE DIF. OR FXD. VECTOR FRO	M	XSQDFR
LANGUAGE INTEGER VECTOR	\$FAST SQUARE ELEMENTS OF A MACHINE	L	SQRMLI
VECTOR	\$SQUARE ELEMENTS OF FXD OR FLTG	M	SQUARE
OR	\$WIENER-LEVINSON LEAST SQUARE ERROR FILTER OR PREDICT	F	WLLSFP
WITH ROUNDING	\$SQUARE ROOT OF A FIXED VECTOR	M	XSQRUT
OR	\$SQUARE ROOT OF A FLOATING VECT	M	SQROOT
E	\$FIND THE POWER SERIES SQUARE ROOT OF A POLYNOMIAL	F	PSQRT
FXD VECTOR	\$PROBABILITY THAT A CHI-SQUARED VARIATE EXCEEDS A VALU	F	KINT1
	\$SUM THE SQUARED ELEMENTS OF A FLTG OR	M	SQRSUM
	\$MULTI-INPUT FILTER BY LEAST SQUARES	F	MIFLS
	\$MULTI-INPUT PREDICTOR BY LFAST SQUARES	F	MIPLS
RATION	\$LEAST SQUARES LINE	F	LSLINE
• 1-DIMENSIC	\$LEAST SQUARES SHAPER BY SIDEWAYS ITE	F	LSSS1
• 2-DIMENSIONS	\$REALIZABLE LEAST SQUARES PREDICTOR BY RECURSION	F	RLSPR
	\$REALIZABLE LEAST SQUARES PREDICTOR BY RECURSION	F	RLSPR2
	\$REALIZABLE LEAST SQUARES SHAPER BY RECURSION	F	RLSSR
OF A SUCCEEDING INPUT OR OUTPUT STATEMENT	\$REPLACE THE FORMAT	M	RPLFMT
PERATE SUBROUTINES BY PROXY CALL STATEMENTS	\$LOCATE AND O	M	LOCATE
IXED POINT	\$DELTA FUNCTION AND STEP FUNCTIONS, FLOATING AND	F	DELTA
	\$FIND LENGTH OF COMMON STORAGE	M	XLCOMN
	\$FAST AND CONVIENT DATA STORAGE ON TAPE	F	ODATA
	\$FAST REVERSE STORAGE ORDER OF A VECTOR	M	REVERS
EMENTS	\$LOCATE AND OPERATE SUBROUTINES BY PROXY CALL STAT	M	LOCATE
REPEATEDLY	\$OPERATE SEVERAL SUBROUTINES OR ONE SUBROUTINE	M	SEVRAL
	\$PLURALIZED FORMS OF SUBROUTINES SETK AND SETVEC	M	SETKP
VECTORS	\$ADD OR SUBTRACT TWO FLOATING OR FIXED	M	VPLUSV
ANOTHER OR FROM A CONSTANT	\$SUM DIFFRENCE OF VECTOR FROM	M	SUMDFR
FXD VECTOR	\$SUM ELEMENTS OF FLOATING OR FI	M	SUM
AISE	\$RAISE VECTOR TO POWER OR SUM POWER OF DEVIATIONS FROM B	M	POWER
	FRM ANOTHER OR FROM A CONSTANT	M	SQRDFR
	\$SUM SQUARE DIF. OF FLTG VECTOR	M	XSQDFR
	FROM ANOTHER OR FROM A CONSTANT	M	SQRSUM
FLTG OR FXD VECTOR	\$SUM THE SQUARED ELEMENTS OF A	M	FAPSUM
	\$COMPUTE A LOGICAL SUMCHECK	M	INTSUM
ED VECTOR	\$INTEGRATED SUMMATION OF A FLOATING OF FIX	M	BLKSUM
ING BLOCKS OF CONSTANT LENGTH	\$SUMMATION OF VECTOR OVER ABUTT	M	MUVADD
TOR	\$FAST MOVING SUMMATION OF A FIXED POINT VEC	M	MVNSUM
ONSTANT	\$MOVING SUMMATION WITH DIVISION BY A C	M	SWITCH
STEST THE CONDITION OF ANY SENSE SWITCH	\$FACTOR A SYMMETRIC POSITIVE DEFINITE MA	F	MFACT
TRIX	\$IMENSIONAL ARRAY \$ROTATE CENTRO-SYMMETRIC OR ANTISYMMETRIC 2-D	F	ROAR2
IMENSIONAL ARRAY	\$GENERATE SYMMETRICAL FILTER WITH GIVEN	F	GNFLT1
AMPLITUDE RESPONSF	\$POLYNOMIAL SYNTHESIS FROM REAL AND COMPLE	F	POLYSN
X ROOTS	\$POLYNOMIAL SYNTHESIZED FROM ITS REAL AND	F	PLYSYN
COMPLEX ROOTS	\$LINEAR INTERPOLATION IN A TABLE	F	LINTR1

SQUADRATIC INTERPOLATION IN A TABLE		F	QINTR1
GENERATE COSINE OR SINE HALF-WAVE TABLES, FIXED OR FLOATING	\$G	M	COSTBL
CORP. MILLION RANDOM DIGITS FROM TAPE	\$ACCESS ROUTINE FOR RAND	F	GETRD1
RETRIEVAL OF DATA FROM A SPECIAL TAPE	\$FAST AND CONVENIENT	F	INDATA
MATION FOR AN INDATA-OUDATA TYPE TAPE	\$LIST AUXILIARY INFOR	F	LISTING
FORWARD OR BACKWARD OVER FILES ON TAPE	\$SKIP	F M	FSKIP
	\$FAST COPY FILE FROM ONE TAPE TO ANOTHER - VERSION 2	M	CPYFL2
	\$LIST DATA DECK AND REPOSITION TAPE TO FRONT OF DECK	F	DADECK
RMAT VECTOR	\$WRITE OUTPUT TAPE WITH NORMAL OR LITERAL	F O	FMTOUT
AST AND CONVENT DATA STORAGE ON TAPE	\$F	F	OUDATA
D FOR ADDING TO AN INDATA-OUDATA TAPE	\$INITIALIZE	F	SETINO
READ EVERY N-TH WORD FROM BINARY TAPE	3 N	N	PACDAT
WARD OR BACKWARD OVER RECORDS ON TAPE	\$SKIP	F M	RSKIP
	\$TERMINATE AN INDATA-OUDATA TAPE	F	TRMINO
RD IS END OF FILE AND REPOSITION TAPE	\$TEST IF NEXT TAPE RECO	M	ZEFBCD
	\$WRITE BINARY DATA ON TAPE	M	WRTDAT
R VECTOR SPRINT OR WRITE OUTPUT TAPE	A MACHINE LANGUAGE INTEGE	F	PWMLIV
REPOSITION TAPE	\$TEST IF NEXT TAPE RECORD IS END OF FILE AND	M	ZEFBCD
	\$OPTIONAL ONLINE MONITOR OF BCD TAPE WRITING	M	ONLINE
E	\$TERMINATE AN INDATA-OUDATA TAPE	F	TRMINO
D OF FILE AND REPOSITION TAPE	\$TEST IF NEXT TAPE RECORD IS EN	M	ZEFBCD
E SWITCH	\$TEST THE CONDITION OF ANY SENS	M	SWITCH
ID SUBPROGRAMS FOR INCREMENTING, TESTING, AND SETTING	\$HYBR	M	INDEX
	\$WRITE HOLLERITH TEXT ON SCOPE	M	7090DISPLA
	\$WRITE HOLLERITH TEXT ON SCOPE	M	709DISPLA
090 INTERVAL CLOCK	\$FOR REAL TIME TIMING IN SECONDS USING 7	M	7090CLOCK1
EN ACCURACY	\$FIND OPERATION TIME OF NEXT SUBROUTINE TO GIV	M	TIMSUB
FOURIER TRANSFORM WITH ARBITRARY TIME ORIGIN	\$QUICK INVERSE	F	QIFURY
FORM OF TRANSIENT WITH ARBITRARY TIME ORIGIN	\$FAST FOURIER TRANS	F	QFURRY
F GIVEN PROGRAM RANGE	\$REAL TIME, TO SPECIFIED ACCURACY, O	M	709TIMA2B
UEST IF NOT	\$CHECK IF INTERVAL TIMER IS ON MAKING ON-LINE REQ	F	CLKON
NTerval CLOCK	\$FOR REAL TIME TIMING IN SECONDS USING 7090 I	M	7090CLOCK1
CES	\$FAST TRACK THROUGH A VECTOR OF INDIV	M	FASTRK
	\$AUTOSPECTRUM BY COSINE TRANSFORM OF AUTOCORRELATION	M	ASPEC2
BITRARY TIME ORIGIN	\$FAST FOURIER TRANSFORM OF TRANSIENT WITH AR	F	QFURRY
ORIGIN	\$QUICK INVERSE FOURIER TRANSFORM WITH ARBITRARY TIME	F	QIFURY
D PARTS	\$FAST COSINE AND/OR SINE TRANSFORMS FROM 2 OR 4 EVEN-OD	M	COSP
S	\$FAST COSINE AND/OR SINE TRANSFORMS OF ODD-LENGTH SERIE	F	COSISI
RRELATIONS	\$FAST COSINE TRANSFORMS OF ONE-SIDED AUTOCO	M	ASPECT
N FUNCTIONS	\$FAST COSINE, SINE TRANSFORMS OF CROSS-CORRELATIO	F	XSPEC
	\$CROSSCORRELATION OF TRANSIENT VECTORS OF MATRICES	F	CRSVM
ORIGINS	\$FAST FOURIER TRANSFORM OF TRANSIENT WITH ARBITRARY TIME	F	QFURRY
	\$COMPLETE CONVOLUTION OF TWO TRANSIENTS	M	CONVLV-II
	\$COMPLETE CONVOLUTION OF TWO TRANSIENTS	F	CONVLV
LAG	\$CROSSCORRELATION OF TRANSIENTS BEGINNING WITH ANY	F	CROST
LAG	\$CROSSCORRELATION OF TRANSIENTS BEGINNING WITH ZERO	F	CROSS
	\$QUICK CROSSCORRELATION OF MLT TRANSIENTS	F	QXCOR1
	\$MATRIX TRANPOSE	M	MATRA
	\$SQUARE MATRIX TRANPOSE	M	MATRA1
	\$INVERSION OF TRAPEZOIDAL INTEGRAL	M	IINTGR

\$INDEFINITE INTEGRAL BY TRAPEZOIDAL RULE	M	INTGRA
ON OR ITS MAGNITUDE		TINGL
\$DEFINITE TRAPEZOIDAL INTEGRAL OF FUNCTION	M	MVNTIN
TE VALUE INTEGRAL		TAMVL
\$MOVING TRAPEZOIDAL INTEGRAL OR ABSOLUTE	M	XFIXM
FET OR RIGHT END		XDIV
\$TRIANGULAR AVERAGING, MOVING L	M	FIRE2
NUMBER TO MACHINE INTEGER		PLANSF
\$TRUNCATE OR ROUND FLOATING PT.	M	UNPAKN
RAN-II INTEGRAL\$FXD PT DIVIDE WITH TRUNCATION OR ROUNDING TO FORT	M	SMPSON
POSITION		MAXSN
\$TWO-DIMENSIONAL FILTER BY RECURSIVE	F	KIINT1
UM		ABSVAL
TA VECTOR		FASCNI
\$MPSON INTEGRAL AND/OR INTEGRATE\$UNSCALE OR SCALE VECTOR FOR SIGN	F	NMZMG1
VECTOR		SEARCH
\$FIND SIGNED OR UNSIGNED EXTREMAL VALUES OF A	M	SETK -II
A CHI-SQUARED VARIATE EXCEEDS A VALUE		MVNTIN
\$PROBABILITY THAT A	F	INTOPR
\$FAST ABSOLUTE VALUE OF A VECTOR	M	CHOOSE
MENT EQUAL OR GREATER THAN GIVEN VALUE\$FAST SCAN VECTOR FOR ELEMENT	M	FRQCT2
ALIZE A VECTOR TO GIVEN MAXIMUM VALUE		MAXSN
\$SNOR	M	MAXSNM
\$SEARCH A VECTOR FOR A VALUE	M	XLIMIT
* OF VARIABLES EQUAL TO A SINGLE VALUE (FXD OR FLTG)\$SET ANY NO. OF	F	SCPSCL
TRAPEZOIDAL INTEGRAL OR ABSOLUTE VALUE INTEGRAL		SETK
OR FOR 1 TO 4 EVENLY SPACED DATA VALUES		NXALRM
\$INTERPOLATION OPERATOR	M	SETKVS
VARIABLES TO ONE OF TWO SETS OF VALUES		SETKS -II
\$SET A LIST OF M		GETX
NGES FREQUENCY COUNT OF NUMBER OF VALUES OF A SERIES IN GIVEN RANGE	M	DSPFMT
FIND SIGNED OR UNSIGNED EXTREMAL VALUES OF A VECTOR		VARARG
\$M		ADDK
SEXTREMAL VALUES OF MATRIX ELEMENTS	M	MULK -II
GUMENT FALLS INSIDE TWO LIMITING VALUES		CSOUT
\$FIND IF ARE	M	CMPARP
RS FOR SCOPE, CLIPPING EXCESSIVE VALUES		LIMITS
\$SCALE VECTOR TO INTEGER	M	CMPARP
SET VARIABLES OR VECTORS TO GIVEN VALUES		CHOOSE
\$CAN VECTOR FOR POSSIBLE BLOCK OF VALUES ALL ABOVE GIVEN LEVELS	F	WHICH
NO. OF VECTORS EQUAL TO SEPARATE VALUES (FXD OR FLTG) \$SET ANY NO. OF	M	VRSOUT
TOPS		SETK -II
\$ALLOWS VARIABLE DEPTH INDEXING OF VEC	M	SETKS -II
OR FOR SCOPE SUBROUTINE DISPLA		XLOCV
\$VARIABLE ORIGIN FORMAT GENERATOR	M	XACTEQ
CES		SETK
\$ENABLE FORTRAN VARIABLE LENGTH CALLING SEQUENCER	M	KIINT1
CONSTANTS		BOOST
\$MODIFY A SET OF VARIABLES BY A CONSTANT OR BY	M	CHSIGN
CONSTANT		ABSVAL
\$MULTIPLY ANY NO. OF VARIABLES BY A SINGLE FLTG. PT	F	
FORMAT		
\$OUTPUT VARIABLES FIVE PER LINE IN G F M		
E PAIRS OF VARIABLES OR A SET OF VARIABLES FOR EQUALITY \$COMPAR	M	
M GIVEN LIMITS		
\$CHECK THAT VARIABLES FROM LIST FALL WITHIN	M	
S FOR EQUALITY \$COMPARE PAIRS OF VARIABLES OR A SET OF VARIABLE	M	
F VALUES		
\$SET A LIST OF VARIABLES TO ONE OF TWO SETS OF M		
ZERO		
\$CHOOSE BETWEEN TWO VARIABLES BY A THIRD ONE BEING M		
FORMAT		
\$OUTPUT VARIABLES BY NORMAL OR LITERAL M		
LUE (FXD OR FLTG)\$SET ANY NO. OF VARIABLES EQUAL TO A SINGLE VA	F	
LUES (FXD OR FLTG)\$SET ANY NO. OF VARIABLES EQUAL TO SEPARATE VA	F	
E VECTOR OF MACHINE ADDRESSES OF VARIABLES IN A LIST		
\$CREATE M		
NG SIGN \$SIGN OF DIFFERENCE OF 2 VARIABLES OR 0 IF SAME INCLUDING	M	
VALUES		
\$SET VARIABLES OR VECTORS TO GIVEN M		
SPROBABILITY THAT A CHI-SQUARED VARIATE EXCEEDS A VALUE	F	
ANT TO ELEMENTS OF A FXD OR FLTG VECTOR		
\$ADD A CONST M		
\$CHANGE ALL SIGN BITS OF A VECTOR	M	
\$FAST ABSOLUTE VALUE OF A VECTOR	M	

RT FORTRAN INTEGER VECTOR TO MLI VECTOR	\$FAST CONVE	M	ITOMLI
\$FIND AVERAGE OF FLOATING VECTOR		M	AVRAGE
OR UNSIGNED EXTREMAL VALUES OF A VECTOR	\$FIND SIGNED	M	MAXSN
\$FLOAT A VECTOR		M	FLOATV
CY DISTRIBUTION OF A FIXED POINT VECTOR	\$FREQUEN	F	FREQT1
SUMMATION OF A FLOATING OR FIXED VECTOR	\$INTEGRATED	M	INTSUM
NGE SPACING, OR CHANGE SIGN OF A VECTOR	\$MOVE, REVERSE	CHA	MOVREV
TRAN INTEGER VECTOR AS HOLLERITH VECTOR	\$PACK UP FOR	M	IVTOHV
PE WITH NORMAL OR LITERAL FORMAT VECTOR	\$WRITE OUTPUT	TA F	FMTOUT
\$COLLAPSE ODD-LENGTHED VECTOR	ABOUT ITS MIDPOINT	M	KOLAPS
\$SPREAD OUT HOLLERITH VECTOR	AS FORTRAN INTEGERS	M	HVTIOV
\$PACK UP FORTRAN INTEGER VECTOR	AS HOLLERITH VECTOR	M	IVTOHV
\$DIVIDE A FLOATING VECTOR	BY A CONSTANT	M	DIVIDE
T INTEGER ARY INCREMENTS	\$VECTOR	DOT PRODUCT WITH ARBITR	M
\$DIFFERENCE FIXED OR FLOATING VECTOR	ELEMENTS IN PAIRS	M	DIFPRS
\$FAST DOUBLING OR HALVING OF A VECTOR	(FIXED OR FLOAT NG)	M	DUBLX
FATER THAN GIVEN VALUE\$FAST SCAN VECTOR	FOR ELEMENT EQUAL OR GR	M	FASCN1
OR DECREASING BEHAVIOR	FOR MOMOTONE INCREASING	M	MONOCK
\$COLLAPSE ONE-SIDED VECTOR	INTO SMALLER RANGE	M	COLAPS
\$DERIVATIVE OF A VECTOR OF DIFFERENCING		M	DERIVA
\$FAST TRACK THROUGH A VECTOR OF INDICES		M	STRK
\$REVERSE VECTOR OF MATRICES		F	MRVRS
CONSTANT LENGTH \$SUMMATION OF MULTIPLE FRAME SCOPE PLOTS OF	\$VECTOR	OVER ABUTTING BLOCKS OF	M
\$MULTIPLE FRAME SCOPE PLOTS OF	VECTOR SETS	F	BLKSUM
\$MOVE A VECTOR	TO A DIFFERENT LOCATION	M	GRAPH
CONVERSELY \$SCALE, CONVERT FLTG.	VECTOR TO MACHINE INTEGERS OR	M	MOVE
\$FAST CONVERT FORTRAN INTEGER	VECTOR TO MLI VECTOR	M	FXDATA
ON \$HI-SPEED EXPANSION OF A	UNDER CUBIC INTERPOLATI	M	ITOMLI
G	VECTOR WITH OR WITHOUT ROUNDIN	M	EXPAND
INCREASING SIZE) OF ELEMENTS IN A	VECTOR	M	FIXV
OVING SUMMATION OF A FIXED POINT	\$FAST MAKE INDEX (BY I	M	SIZEUP
\$FAST REVERSE STORAGE ORDER OF A	FAST M	M	MUVADD
TS OF A MACHINE LANGUAGE INTEGER VECTOR		M	REVERS
\$FIND AVERAGE OF FIXED PT VECTOR	\$FAST SQUARE ELEMEN	M	SQRMLI
\$MOVING AVERAGE OF A VECTOR		M	XAVRGE
SMOVING MEAN SQUARE AVERAGE OF A VECTOR		F	MVNAV
\$NORMALIZE AND CHANGE MEAN OF A VECTOR		F	MVSQAV
TAPE A MACHINE LANGUAGE INTEGER VECTOR		F	NRMVEC
\$REMOVE THE MEAN FROM A FIXED VECTOR	\$PRINT OR WRITE OUTPUT	F	PWMLIV
\$REMOVE THE MEAN FROM A FLOATING VECTOR		M	XREMAV
UND UP, OR ROUND DOWN A FLOATING VECTOR		M	REMAV
\$SQUARE ELEMENTS OF FXD OR FLTG VECTOR		M	RNDV
\$SQUARE ROOT OF A FLOATING VECTOR		M	SQUARE
UM ELEMENTS OF FLOATING OR FIXED VECTOR		M	SQROOT
QUARED ELEMENTS OF A FLTG OR FXD VECTOR		M	SUM
UNPACK AND RESCALE A PACKED DATA VECTOR		M	SQRSUM
\$DIVIDE A FXD VECTOR BY A CONSTANT		M	UNPAKN
INSTANT	\$MULTIPLY VECTOR BY FLOATING OR FIXED CO	M	XDIVIDE
RMAT WITH SPACING	\$OUTPUT NAMED VECTOR BY NORMAL OR LITERAL FO	F	MULPLY
			VOUT

VEN INCREMENTS	\$FORM A VECTOR BY SIFTING ANOTHER AT E M	SIFT
LEFT OR RIGHT	\$DIVIDE ELEMENTS OF ONE VECTOR BY THOSE OF ANOTHER M	VDVBYV
OR RIGHT	\$SHIFT VECTOR ELEMENTS ARITHMETICALLY M	SHFTR1
	\$SHIFT VECTOR ELEMENTS LOGICALLY LEFT M	SHFTR2
	\$REVERSE A VECTOR ELSEWHERE OR IN PLACE M	REVER
Y MODE)	\$SET ALL ELEMENTS OF VECTOR EQUAL TO A CONSTANT (AN M	SETKV
NT	\$ SET FXD OR FLTG VECTOR EQUAL TO A LINEAR SEGME M	SETLIN
	\$SEARCH A VECTOR FOR A VALUE M	SEARCH
OM FIRST OR LAST TERM	\$SEARCH VECTOR FOR NUMBER, STARTING FR F	SRCH1
ALUES ALL ABOVE GIVEN LFVFLSSCAN VECTOR FOR POSSIBLE BLOCK OF V F	NXALRM	
D/OR INTEGRATE \$UNSCALE OR SCALE VECTOR FOR SIMPSON INTEGRAL AN F	SMPSON	
CONSTANT\$SUM SQUARE DIF. OR FXD. VECTOR FROM ANOTHER OR FROM A M	XSQDFR	
CONSTANT \$SUM DIFFERENCE OF VECTOR FROM ANOTHER OR FROM A M	SUMDFR	
CONSTANT\$SUM SQUARE DIF. OF FLTG VECTOR FROM ANOTHER OR FROM A M	SQRDFR	
ANGE AND INCREMENT \$CREATE ONE VECTOR FROM ANOTHER WITH NEW R M	NURINC	
ARTS (OR INVERSE)	\$SPLIT A VECTOR INTO ITS EVEN AND ODD P M	SPLIT
VARIABLES IN A LIST	\$CREATE VECTOR OF MACHINE ADDRESSES OF M	XLOCV
ITERAL FORMAT	\$OFFLINE VECTOR OUTPUT WITH NORMAL OR L F	VECOUT
REGISTER	\$SCALE AND FIX DATA VECTOR, PACK N DATA POINTS PER M	PAKN
	\$REFLECT A FIXED OR FLOATING VECTOR THROUGH A CONSTANT M	REFLEC
	\$NORMALIZE A VECTOR TO GIVEN MAXIMUM VALUE M	NMZMG1
CLIPPING EXCESSIVE VALUES	\$SCALE VECTOR TO INTEGERS FOR SCOPE, M	SCPSCL
F DEVIATIONS FROM BASE	\$RAISE VECTOR TO POWER OR SUM POWER O M	POWER
	\$FAST SET VECTOR TO ZERO M	STZ
ARBITRARY AMOUNT	\$ROTATE A VECTOR UPWARDS OR DOWNWARDS AN M	ROTAT1
	\$SQUARE ROOT OF A FIXED VECTOR WITH ROUNDING M	XSORUT
LLOWS VARIABLE DEPTH INDEXING OF VECTORS	\$A M	GETX
	\$EXCHANGE ANY TWO VECTORS M	EXCHVS
	\$FAST DOT PRODUCT OF TWO VECTORS M	FDOT
	\$MOVE AN ARBITRARY SET OF VECTORS M	MOVECS
	\$FAST REVERSAL OF SPECIAL VECTORS ,AS PRODUCED BY SPLIT. M	CHPRTS
ORMATS	\$OUTPUT COLUMN VECTORS BY NORMAL OR LITERAL F M	CVSOUT
\$FAST COMPARE TWO ARBITRARY MODE VECTORS FOR IDENTITY M	CMPARV	
	\$CROSSCORRELATION OF TRANSIENT VECTORS OF MATRICES F	CRSVM
ODUCT OR REVERSED DOT PRODUCT OF VECTORS OF MATRICES	\$DOT PR F	MDOT3
ODUCT OR REVERSED DOT PRODUCT OF VECTORS OF MATRICES	\$DOT PR F	MDOT
R SUBTRACT TWO FLOATING OR FIXED VECTORS	\$ADD O M	VPLUSV
FR PLOT OF A SET OF EQUAL LENGTH VECTORS	\$PRINT F	PLTVS1
PRINTER-PLOT OF ARBITRARY SET OF VECTORS	\$ F	PLOTVS
ORMATS WITH SPACING\$OUTPUT NAMED VECTORS BY NORMAL OR LITERAL F M	VSOUT	
FS (FXD OR FLTG) \$SET ANY NO. OF VECTORS EQUAL TO SEPARATE VALU M	SETKVS	
	\$SET LINEAR VECTORS, FIXED AND/OR FLOAT+NG M	SETLNS
	\$MULTIPLY ELEMENTS OF TWO VECTORS FIXED OR FLOATING M	VTIMSV
	\$SET VARIABLES OR VECTORS TO GIVEN VALUES M	SETK
	\$SET A LIST OF VECTORS TO ZFRO M	STZS
ANT	\$DOT PRODUCT OF TWO VECTORS WITH DIVISION BY CONST M	VDOTV
NG	\$DIVIDE ELEMENTS OF TWO FIXED VECTORS WITH OR WITHOUT ROUNDING M	XDVVBV
	\$GENERATE COSINE OR SINE HALF-WAVE TABLES, FIXED OR FLOATING M	COSTBL
R SPECTRUM TO FIND MINIMUM PHASE WAVELET	\$FACTOR POWE M	FACTOR
	\$WIENER AUTOCORRELATION F	WAC

RROR FILTER OR PREDICTOR	\$WIENER-LEVINSON LEAST SQUARE E F	WLLSFP
	\$READ EVERY N-TH WORD FROM BINARY TAPE N	PACDAT
SCOMPARE ARITHMETICALLY TWO WORDS WHERE -O IS LESS THAN +O M	CMPRA	
OR LITERAL FORMAT VECTOR	\$WRITE HOLLERITH TEXT ON SCOPE M 7090DISPLA	
NGUAGE INTEGER VFCTOR	\$WRITE HOLLERITH TEXT ON SCOPE M 709DISPLA	
IONAL ONLINE MONITOR OF BCD TAPE WRITING	\$WRITER OUTPUT TAPE WITH NORMAL F FMTOUT	
O VARIABLES BY A THIRD ONE BEING ZERO	\$WRITER BINARY DATA ON TAPE M WRTDAT	
\$FAST SET VECTOR TO ZERO	\$CHOOSE BETWEEN TW M PWMLIV	
\$SET A LIST OF VECTORS TO ZFRO	M ONLINE WHICH	
	M STZ	
	M STZS	

## 7. Difference Between Programs Sets I and II

Additions 172 programs have been added to Set I in forming Set II. They are

ADDK	FASCUB	MDOT	QUFIT1	STZS
ARBCOL	FASTRK	MDOT3	QXCOR1	SUM
ARCTAN	FIRE2	MEMUSE	RDATA	SUMDPR
ASPEC2	FIXV	MFACT	REFLEC	SWITCH
AVRAGE	FLOATV	MIFLS	REMAV	TAMVL
BLKSUM	FMTOUT	MIPLS	REREAD	TIMA2B(7094)
BOOST	FNDFMT	MISS	REVER	TIMSUB
CARIGE	FT24-II	MONOCK	RLSPR	TINGL
CHOOSE	GETHOL	MOUT	RLSPR2	TRMINO
CHSIGN	GETX	MOUTAI	RLSSR	VDOTV
CLKON	GNHOLE	MOVECS	RMSDEV	VDVBYV
CMPARP	GRAPHX	MOVREV	RNDV	VECOUT
CMPARV	HLADJ	MRVRS	ROAR2	VOUT
CMPRA	HVT0IV	MULK-II	RPLFMT	VPLUSV
CNTRDB	IDERIV	MULLER	SEQSAC	VRSOUT
CNTROW	IFNCTN	MULPLY	SETINO	VSOUT
COLABL	IINTGR	MVINAV	SETK	VTIMSV
CONTUR	INDEX	MVNSUM	SETK-II	WHICH
COSIS1	INTGRA	MVNTIN	SETKP	WRTDAT
CPYFL2	INTHOL	MVSQAV	SETKS-II	XACTEQ
CROSS	INTOPR	MXRARE	SETKV	XAVRGE
CROST	INTSUM	NRMVEC	SETKVS	XDIV
CRSVM	IVTOHV	NTHA	SETLIN	XDVIDE
CSOUT	IXCARG	NURINC	SETLNS	XLCOMN
CUFIT1	LIMIT3	ONLINE	SEVRAL	XLIMIT
CVSOUT	LOCATE	PACDAT	SHUFFL	XLOCV
DADECK	LSHFT	PLANS P	SIFT	XOOZE
DELTA	LSLINE	PLOTVS	SIZEUP	XREMAV
DERIVA	LSSS1	PLTVS1	SMPSON	XSQDFR
DIFPRS	MATINV	PLURN S	SPCOR2	XSQRUT
DIVIDE	MATML1	POLYSN	SQRDFR	XVDVBV
DOTJ	MATML3	POWER	SQROOT	ZEFBCD
DOTP	MATRA	QFURRY	SQRSUM	
EXCHVS	MATRA1	QIFURY	SQUARE	
EXPAND	MAXSNM	QINTR1	SRCH1	

Deletions 11 programs have been deleted from Set I in forming Set II. They are

ATSH	CRST1	GNFMT1	UPDATE
BENIMP	GETREC	ORGDLT	WRTREC
BENSPT	GETREC-II	ROKWIC	

Carryovers 95 programs were carried over from Set I to Set II. In all cases the date appearing on the first card of the symbolic deck has been changed and in most cases other changes have also been made, mostly to upgrade the documentation but in some cases to improve the coding.

The carryovers are

ABSVAL	PSKIP	LOC	QXCORR
ADANL	PT24	MAXSN	REVERS
AMPHZ	FXDATA	MLISCL	RND
ASPECT	GENIOL	MLI2A6	ROTAT1
CHISQR	GETRD1	MOVE	RSKIP
OHPRTS	GNFLT1	MPSEQ1	SAME
CLOCK1 (7050)	GRAPH	MSCON1	SCPSCL
COLAPS	GRUP2	MUVADD	SEARCH
CONVLV	HSTPLT	MVBLOK	SHPTR1
CONVLV-II	HSTPLT-II	NMZMG1	SHPTR2
COSP	HSTPLT-III (709)	NOINT1	SIMEQ
COSTBL	HSTPLT-III (7090)	NXALRM	SPLIT
DISPLA (709)	INDATA	OUDATA	SQRMLI
DISPLA (7090)	IPLYEV	PAKN	STZ
DSPPFMT	ITOMLI	PLYSYN	UNPAKN
DUBLX	KIINT1	POKCT1	VARARG
FACTOR	KOLAPS	POLYDV	WAC
FAPSUM	LINE (709)	POLYEV	WLLSFP
FASCN1	LINE (7090)	PRBFIT	XFIXM
FDOT	LINEH (709)	PROB2	XSPECT
FLOATM	LINEH (7090)	PROCOR	
FRAME (709)	LINEV (709)	PSQRT	
FRAME (7090)	LINEV (7090)	PWMLIV	
FRQCT1	LINTR1	QACORR	
FRQCT2	LISTNG	QCNVLV	